

D^R W I L L I S'S
Practice of Physick,

Being the whole

WORKS
OF THAT
R E N O W N E D and F A M O U S
P H Y S I C I A N :

C O N T A I N I N G

These Eleven Several Treatises, viz

- I. Of Fermentation.
- II. Of Feavers.
- III. Of Urines.
- IV. Of the Accension of the Blood.
- V. Of Musculary Motion.
- VI. Of the Anatomy of the Brain.
- VII. Of the Description and Use of the Nerve.
- VIII. Of Convulsive Diseases.
- IX. Pharmaceutice Rationalis, the First and Second Part.
- X. Of the Scurvy.
- XI. Two Discourses concerning the Soul of Brutes.



Wherein most of the Diseases belonging to the Body of
Man are Treated of, with excellent Methods and Receipts for the Cure
of the same.

Fitted to the meanest Capacity by an Index for the Explaining of all the
hard and unusual Words and Terms of Art derived from the Greek, Latine,
or other Languages, for the Benefit of the English Reader.

With Forty Copper Plates.

The Pharmaceutice new Translated, and the Whole
carefully Corrected and Amended.

L O N D O N,

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the Corner of Chancery-Lane, and the Flower-de-Luce over against
St Dunstons Church in Fleet-street, MDCCLXXXIV.

TO THE
RIGHT WORSHIPFUL
S^r Theophilus Biddulph,
KNIGHT and BARONET.

Honoured Sir,

I Have presumed to Dedicate these my Labours to you, being the Translation of a most Worthy and Learned Author, Dr. Thomas Willis his Works, out of the Latine, into our Mother Tongue, for the benefit of my Country-men: and knowing you have always been a general, and generous Patriot, a lover of your Country, and of all manner of Industry and Ingenuity, I question not, but you will kindly receive this my Dedication; though not for my sake, yet for the many admirable things that may be found in the Book it self, and for the Good and Benefit, which this my Laborious Task may bring to the Publick. As I doubt not of your innate Goodness, having already had some particular Experience thereof, so I shall no ways fear an unkind Reception: And although I launch not into the Sea of your Praises, as is the late Custom of Dedicators to do, I am perswaded, that this my plain Epistle will be as kindly accepted; for I know you to be so modest a Man, as not to love to see all your good Actions, Virtues and Worth, Rhetorically painted and laid open before your Eyes: for as your Worth is too well known, this way to receive any addition; so the praise thereof being needless, will rather cause you to blush, than be any ways pleas'd. But yet I cannot forbear to take notice to the World, that your whole Life has been a true Pattern of Loyalty and Religion, which in these Troublesome and Distracted Times,

B
may

The Epistle Dedicatory.

may be worthily related and mentioned, as a praise-worthy Example for others to imitate and follow: and that you are both a true lover of the Church of England, your King, and Country, which you have eminently shew'd in all your Actions, and manifested to the World, by your several Publick Employments, in the behalf of your Country, and of the Renowned City of London, of which you are a most worthy Member. And no doubt, but that it is for this, your stedfastness in Religion, your Loyalty to your Prince, your Love to your Country, and your uprightness in your Dealings, that God hath showered on you all manner of external Blessings, giving you a fair Estate, through your own Industry, Wisdom, and Prudence; a Virtuous Consort, and a prosperous Issue, the fair and flourishing Branches of your Ancient Stock and Family: To all which outward Felicities, I shall pray, That God may also indue your noble Soul with the Celestial and Eternal Blessings and Treasures of the World to come, and that you may be constantly happy both here and hereafter. I remain,

Honoured Sir,

Your most humble

and faithful Servant,

S. PORDAGE.

THE PREFACE.

THE same thing happens to me, about to speak of Fermentation, that once did to a Famous Historian, when he wrote his Commentary of the *Roman* Empire, to wit, whilst he endeavoured to draw forth, as it were in a little Table, the Affairs only of that Nation, he was necessitated not only to recount the Actions of one People, but of all Man-kind: In like manner, whilst I did meditate on a few things only concerning the Energy, and the Means of the working of Ferments, I have brought into this Tract, as it were swelled up with a certain Ferment, the whole Provision, and Dowry of all Nature. Entring upon this Disquisition, I thought I had been tyed only to the Bakers Oven, and Brewers Furnace, being condemned to the Mill, not to have proceeded beyond their limits, unless by chance, or with leave; but after that I had begun to look more deeply into the matter, I perceived I had gotten a far more large Province: Because it plainly appeared, besides these of Art, very many Works of Nature, to be not only like, but themselves the effects of Fermentation: For when, for the solving of the *Phaenomena's*, which are met with about the swelling up of the mealy Mass, and the working of Wine, and of other Liquors, I had Composed divers Arguments, Reasons, and Hypotheses, I found at length, those first begotten Particles, by whose Orgasm or Heat, those vulgar preparations do Ferment, to beget the Causes of Motions, and Alterations, in whatever things they are mix'd with besides; wherefore, I may be pardoned, if I have strayed far from our Proposition, and have seemed to any one, to have heaped together here, too plentiful an Harvest of Matter, because I was wholly led by the same thrid of Ratio-

The P R E F A C E.

Ratiocination, and the most conjunct Affinity of things, to these various and diverse Concretes. If any one shall object, that I prostitute the unusual Notions, and almost only heard of, in the Shops of the Chymists, unhandfomly among the works of ordinary people, I say, these Principles, which being brought indeed to perform the self moving motions of Natural things, also more easily to represent them to the vulgar capacity, and lay them not only before their Eyes, but even into their very Hands; what of these kind of substances, I call Particles, Men, tho' rude and unskilful, may perceive even by the help of their senses to be in the things: besides the names of Sulphur, Salt, and Spirit, and the rest, are more familiarly known, than Matter, and Form, or the four Principles of the *Peripateticks*. As to our Method, and Manner of Philosophizing, no Man can blame me, if I should not here describe all things according to Rule, and Analytick Patterns; because in this Work, it chances for me to wander, without a Guide, or Companion, in solitary places, and as it were in a solitude trodden by no footsteps, where I not only make a Journey, but my way also: therefore, whenever I deviate, I cannot be said to err, among right Judges of our endeavours, who have no Path in which I should Walk, nor could find a Track, which I might fear to miss.

The Table.

Since nothing could so well express the meaning and intention of the Author, as the very *Latin* and *Greek* Words used in these Tracts, we have continued them expressly, and though in many Places I have given their meaning by *Synonyma's*, yet for the benefit of meer *English* Readers, we have here composed a Table Alphabetically of all the hard *Greek* and *Latin* Words, used in the whole Volume; as also of all Terms of Art, and many other Words derived from the *Latin* and *Greek*, tho' usual among Scholars, yet not frequently known to the vulgar, and therefore we have fully explained them, and rendered them intelligible to the meanest Capacity in the following Table.

A TABLE of all the hard words derived from the *Greek* and *Latin*, of all Terms of Art and other words not vulgarly received, with the Explanation of them.

A

- A** Bdomen, *The lower part of the Belly from the Navel downwards.*
 Ablution, *A washing away.*
 Accension, *An Inkindling.*
 Accession, *A coming to or approach.*
 Acme, *The height or top of a thing.*
 Acid, *Sharp.*
 Acidity, *Sharpness.*
 Acidulæ, *Medicinal waters running forth from Veins of Iron, Copper, and such like, called Spaws from that famous place for Mineral-waters, the Spaw in Germany.*
 Acrimony, *Sharpness or sourness rather.*
 Actionobolism, *An Irradiation of Beams, or shooting forth of the spirits like beams of the Sun.*
 Aconite, *A venomous poisonous Herb put for Libbards bane*
 Acute, *Sharp, or excessive painful, or that is quick and dangerous.*
 Aculeated, *Made sharp and prickly like a Needles point.*
 Adhæſion, *A sticking to.*
 Adjuted, *Helped.*
 Adventitious, *Coming by accident, or by the by.*
 Aduſt, *Burnt or parch'd.*
 Aduſtion, *A burning or parching.*
 Equilibrium, *An equal or even poise when the Balance stands bending neither to the one side or the other.*
 Equinox, *When the Sun is in the Equinoctial Line and divides the Day and Night into an equal length, and is about the 12. of March and about the 12. of September.*
 Etherial, *Heavenly or belonging to the Air or Skie.*
 Etiology, *The rendring of the Cause or Reason of a thing.*
 Affection, *Taken for the natural Condition, and often signifies sickness or disease.*
 Affected, *Distempered or diseased. Sometimes natural disturbance.*
 Affuſion, *A pouring forth of any thing.*
 Agaric, *A Drug that purges Phlegm.*
 Aggeſtion, *A heaping together of any thing.*
 Agitated, *A violent shaking or jogging together.*
 Alembic, *An Arabic word for a Still used by Chymists.*
 Alexipharmaca, *Medicines against Poisons and venom.*
 Alexiterion, *The same, being an Antidote against Poison.*
 Alchaliſat, *A salt made of the herb Kali. Also taken and applyed to salts made of Herbs and shells of Fiſhes.*
 Alible, *Nourishable, or that nourishes.*
 Aliment, *Food.*
 Alliſion, *A striking or knocking together.*
 Aloes, *A juice made out of a bitter herb used in purging Medicines, also a sweet wood.*
 Amalgama, *A Chymical Term for the setting and mixture of several Minerals or Metals, or other things whereby a separation and extraction may be made.*
 Ambages, *A compassing or going about.*
 Ambient, *That invirons or compasses one about as the Air.*
 Amulets, *Pomanders or Bracelets made against Witchcraft, and Infection and Poison.*
 Analogy, *Proportion, or agreement or likeness.*
 Analaiſis, *The laying open or unfolding of the matter.*
 Anatomy, *A dissecting the Body, to see the several parts.*
 Anasarca, *The watry Dropſie swelling up the whole flesh.*
 Analeſia, *A stupifying disease that takes away the sense from all parts of the Head.*
 Angle, *A Mathematical Term, being the nook or space at the cutting of two lines; and is of several sorts. A Corner or nook.*

The Table.

Anhelous, *Short-winded, or that puffeth for want of breath; that breatheth difficultly.*

Annular, } *Ringy, or like Rings.*
Annular, }

Anodynes, *Medicines procuring ease from pains by sleep or other means.*

Anomal, *Irregular, out of order.*

Antasthmaticks, *Things good against the Cough or Asthma.*

Anterior, *The former.*

Antidote, *A Medecine against Poyson or any other disease.*

Anticipate, *To go before.*

Antihypnotics, *Medecines given against too much sleeping.*

Antipyreticon, *A Medecine against a Feaver, or a Feaver-Curer.*

Antipyreticks, *Medecines against burning Feavers.*

Antispasmodicks, *Medecines against Convulsions.*

Anus, *The Fundament or Arse-hole.*

Aorta, *The great Artery the mother of all the rest, proceeding from the Heart, one branch ascending, another descending.*

Apoplectic, *One subject to the Apoplexy.*

Apoplexy, *A disease that stupifies and takes away sense and motion.*

Apozems, *Decoctions or drinking medecines made with herbs.*

Appendixes, *Things belonging or depending on another, as the parts about the heart.*

Aquosity, *Waterishness.*

Area, *The void space in a Figure, as a Triangle or Quadrangle: The Plat or Floor of any thing.*

Armoniac, *Salt extracted out of Stones.*

Arteries, *The Vessels that carry the blood to the heart.*

Arthritick, *Gouty or belonging to the Gout.*

Arsnick, *Or Orpiment, a poisonous drug.*

Archeus, *A cheif officer, Workman, or Operator.*

Articulation, *A shooting of spriggs from the joynts.*

Afcites, *A kind of Dropsie which swells between the skin and the flesh.*

Asper, *Sharp, Asper artery, the wind-pipe.*

Assimilation, *A growing or making like.*

Assimulate, *To grow or make like.*

Asthma, *A troublesome disease, when the lungs being stopped, one cannot take breath.*

Asthmatical, *Belonging to that disease, or troubled with it.*

Astringent, *Binding.*

Ataxias, *Disorders, irregularities.*

Atoms, *Small little Bodies, such as motes in the Sun-shine.*

Atrabilous, } *Belonging to the black Bile or melancholy or to the melancholy humour.*
Atrabilary, }

Atrophy, *A disease causing a pining away, or a wasting, or Consumption of the flesh.*

Attrition, *A knocking, or bruising, or rubbing together.*

Auditory, *An Assembly, or those who hear.*

Aurum fulminans, *Or thundering Gold, a metal prepared by Chymical Art, that being heated goes off like a Gun with a Thundering noise.*

Austere, *Biting, harsh.*

Vein is a branch of the Vena Cava coming thorough the arm-hole from the chanel bone descends into the inside of the arm.

Axillarie, } *Artery springs from the left side of the Aorta above the heart, and ascending obliquely throw the arm-holes, and thence sending branches into the upper ribs, shoulder and chanel bone, it descends down to the bowing of the Elbow.*

Azygos vein, *is a branch of the upper Trunk of the Vena Cava, arising on the right side.*

B

Balneum Mariae, *Is a way of distilling with a Glass-belly, holding the Ingredients put into a Vessel of water, and so fire being made under it, it distills with the heat of the water.*

Balsamic, *Balsamie or belonging to Balsam.*

Basillick Vein, *A large Vein into which the Axillarie vein is carried, called also the Liver vein.*

Basis, *The foundation or foot of a thing.*

Bechicks, *Medecines against the Cough.*

Belly, } *Upper, the head so called.*

Belly, } *Middle, the region of the stomach.*

Belly, } *Lower, The parts below the Midriff, containing the Intestines.*

Bezoartick, *Belonging or made of the precious stone Bezoar.*

Bezoar, *A precious stone brought out of the Indies very Cordial.*

Bile, *Choler.*

Biliary, *Belonging to Bile or Choler, sometimes applied to the vessel containing the Choler.*

Bipartite, *Divided into two parts.*

Bolus, *Is a Medecine made up into a thick substance to be swallow'd not liquid, but taken on a Knives point.*

Botonick, *Pertaining to herbs or herby.*

Brachial, *Belonging to the Arm.*

Bronchia, *The grisly parts about the wind-pipe*

Buboes, *Filthy swellings about the groin.*

C

Cachexia, *An evil disposition of the Body when all the nutriment turns into evil humours.*

Cachectical, *To such evil state or disposition be-*

The Table.

- belonging, or one troubled with such evil disposition.*
- Cachochymical,** Full of evil and bad juice in the body, of very ill digestion.
- Callous,** Hard, fleshy and brawny.
- Calx,** Ashes, Lime, sometime taken for the remaining parts of things Chymically drawn off.
- Capillaments,** Small hairy threds of the Nerves.
- Caput mortuum,** The dead head, being the last thing remaining after several Chymical extractions and good for nothing but to be flung away, all virtue being extracted.
- Carbuncle,** A red fiery sore; a Plague-sore.
- Cardiack,** Cordial, or belonging to the Heart.
- Carotides,** Two arteries which arising out of the Axillarie Artery, are carried thorow the side of the Neck upwards into the skull.
- Carthamums,** A little seed used in Medecines.
- Caruncles,** Little peices of flesh.
- Cartilage,** Is a gristle or tendril, a substance somewhat softer than a bone, and harder than a Ligament.
- Cartilaginous,** Gristly, or belonging to, or full of such gristles.
- Cassia,** A sweet shrub like Cinamon, also a drug that purgeth.
- Cataplasm,** A Poultis or asswaging Plaister.
- Catarrh,** A great Rheum falling from the head into the mouth.
- Cathartic,** A purging Medecine.
- Cava vena,** The great Liver-vein going thorow the Body.
- Cavity,** Hollownes.
- Cautic,** } A Composition made to burn a hole in
Cautery, } the skin and flesh to make Issues.
- Celiac vessels,** Vessels belonging to the Belly.
- Celebrated,** Performed or done.
- Cephalalge,** The Head-ach.
- Cephalic,** Belonging to the head, a Medecine proper for the head.
- Cephalic vein,** Which springing out of the Axillary vein, passes between the first and second muscle of the shoulder, and so passes evidently into the Arm.
- Cephalic Artery,** Consists of two branches which springeth out of the great Artery, ascend up into the head.
- Cerebel,** The hinder part of the Brain from whence the Nerves proceed that serve to the vital function.
- Cervical,** Belonging to the Neck.
- Chalybeat,** A Medecine made of prepared Steel, or belonging to Steel.
- Characteristical,** The notes, signs or figures belonging to a Character.
- Chlorosis,** The Green-sickness, or the virgins disease.
- Choleduc vessels,** The vessels that hold and send forth the Gall.
- Choroideid,** Belonging to the Net, like to the infoldings about the Brain.
- Chyle,** Is the juice or substance of of the meat digested.
- Chylification,** The making of Chyle.
- Chyme,** Is the juice of the meat further digested.
- Chronical,** Long and tedious diseases.
- Circumpulsion,** A driving about.
- Classes,** Forms or Orders.
- Coalition,** Nourishment.
- Coagulation,** A curdling like milk, a turning into a Curd, or a separation of the parts like Curds and Whey.
- Coagulum,** Any thing that causeth such a curdling, as Rennet.
- Coagulated,** Curdled.
- Codion,** Boiling or seething, also digestion.
- Cohobation,** A dreyning or pouring off from a settlement.
- Coindications,** Things to be considered with the disease, also signs besides the disease it self.
- Colcothar,** Dross of mettals.
- Colical,** Belonging to the disease called the Colick.
- Colliquation,** A melting together.
- Collation,** A comparing or coupling together.
- Collated,** Compared or Coupled together.
- Collision,** A striking or knocking together.
- Colocynthida,** Or Coloquintida, a bitter purging Gourd or Apple.
- Colon,** The fifth Gut, or that great Gut in which is seated the disease called the Colick.
- Colluvies,** A filthy heap of anything.
- Commisures,** The joyning or joyning of things together, as of the skull bones.
- Complication,** A folding together.
- Conarium,** A Kernel sticking to the outside of the Brain in form of a Pine-apple.
- Concatenation,** A chaining or joyning together.
- Concatenated,** Joyned, tyed, or fastned together.
- Conflagration,** A burning out, or being in a flame, as in Great Feavers.
- Conformation,** The framing, fashioning or disposition of a thing.
- Congelation,** A Freezing or gathering together into an hard substance, as Ice of water.
- Congeled,** Frozen, stifned.
- Congestion,** An heaping or gathering together.
- Conjugation,** Ayoking together, a derivation of things of one kind.
- Consistency,** Thicknes or substance, as a Jelly.
- Convolutions,** Roulings about or together, a twisting together.
- Contexture,** A weaving together, or a framing or composition.
- Copula,** A Joyning or fastning together, fettering.
- Corollary,** Addition, vantage, overplus.
- Corrosive,** Gnawing, eating, corroding.
- Corrugations,** Wrinkling together.
- Cortex,** The bark, shell, peel, or rind.
- Cortical,** Belonging to the bark, or rind, or peel of a thing.
- Cra'sis,** The disposition, complexion, temperature or mixture of natural humours.
- Cra'ss,** Thick.
- Cra'ssament,** A thicknes or thick setting, as of dregs.

The Table.

Cribrious, *Sivellike, or that hath holes like a sieve.*
Crude, *Raw, undigested.*
Crudities, *Raw and undigested humours, or rawness, or undigestion of any thing.*
Crisis, *Is the time of the turn of the disease when it either increases or diminishes, always observed by the Physitians.*
Critical, *To the Crisis, or such time belonging.*
Cremasteral, *Muscles belonging to the Testicles.*
Crural, *belonging to the Leg.*
Crucible, *An earthen vessel used to melt Metal with.*
Cucurbite, *A Glass-body with a great Belly, used in distillations.*
Cuneiform, *Wedge-like or in form of a Wedge: A bone so shap'd.*
Cutaneous, *Belonging to the skin, or skinny.*
Culinarie, *Belonging to the Kitchen.*
Cuticula, *The little thin skin under the Cutis or the upper skin.*
Cutis, *The upper or outward skin of the Body.*

D

Dead head, *The same with Caput mortuum.*
Decapulation, *A pouring off.*
Defection, *A failing, weakness or infirmity.*
Decoction, *A boiling or seething.*
Defecated, *made free from dregs.*
Deflagration, *A flaming or burning forth.*
Dilliquium, *As of the salt of Tartar, a clear draining, also a swooning away, or a failing of the senses.*
Dilirium, *A raving madness, as in Feavers.*
Deltoides, *A muscle in the top of the Arm, having the figure of a Delta, the Greek D.*
Demersed, *Drowned.*
Depauperated, *Made poor or wasted.*
Depraved, *Corrupted or marred.*
Depurated, *Cleansed from dregs.*
Depuration, *A cleansing or making pure.*
Desultory, *Leaping, wavering or inconstant.*
Diabetes, *The Pissing evil; a disease that causeth the party troubled therewith almost continually to piss, and in a great quantity a clear and sweetish water.*
Diocodium, *A Syrup to procure sleep, made of the tops of Poppy.*
Diagnosis, *Dilucidation, or Knowledge.*
Diagridium, *See Scammony.*
Diaphoresis, *Evaporation, as by sweating.*
Diaphoretic, *That causeth Evaporation or sweating forth of humours.*
Diaphanous, *Clear and splendid.*
Diaphragma, *The Midriff that separateth the Heart and Lights from the stomach.*
Diopneon, *3 A breathing forth.*
Diapnoe, *3 A breathing forth.*
Diarrhæa, *A looseness of the Belly, without inflammation, a Lask.*
Discordium, *A Cordial medicine made of Scordium and other Ingredients.*

Diastole, *The rising up of the Heart or Artery, the contrary motion of Systole.*
Diathefis, *The affection or disposition.*
Diluted, *Rinsed or washed.*
Dilucidation, *An explaining or clearing.*
Dioptric, *Belonging to the Perspective, or a Mathematical Instrument, thorough which they look to take the height of a thing.*
Divarications, *A varying or severing into parts running up and down, as the Veins and Nerves.*
Diversory, *A diverting place, or a place to turn of one side out of the way.*
Diuresis, *Evacuation by Urine.*
Diuretick, *A Medecine that causeth evacuation by Urine.*
Dogmatic, *Stiff in Opinion.*
Duodenum, *The first Gut or Intestine of twelve fingers long.*
Dura mater, *The hard membrane or tunicle that encompasseth the brain next the skull.*
Dyscrasie, *Intemperature, as some humour or quality abounding in the Body.*
Dysentery, *A flux of the Belly that corrodes the Bowels and often causeth blood, called then the Bloody flux.*
Dyspathy, *A contrariety of affection.*
Dyspnoea, *A pursiness or shortness of breathing, and a stopping of the Conduits of the Lights.*

E

Ebullition, *A boiling up.*
Eccentric, *Without Centre.*
Eccathartic, *Not purging.*
Eccritic, *Not critical.*
Edulcorated, *Made sweet.*
Effervency, *3 A being very hot or inflamed.*
Effervescency, *3 A being very hot or inflamed.*
Effluvia, *Things that flow out of the Body, as steam and breath thorough the pores of the skin.*
Egestion, *A casting forth as ordure from the body, or any excrementitious humour.*
Egritude, *Sickness or not being well.*
Elastick, *That goeth off with a force like Gunpowder, or spreads forcibly forth with a jerk.*
Elaterium, *A violent strong purging Medicine.*
Elixation, *A boiling.*
Elixir, *An Arabian word for Quintessence, high Cordials so called.*
Elogy, *A report in praise or dispraise of a thing.*
Emanations, *Things that flow or proceed from the Body or its parts; flowing forth.*
Embryo, *The Child before it hath perfect shape in the mothers womb.*
Emissaries, *Places that send forth any thing as the sinks of the body.*
Empirical, *Belonging to an Empirick or of knowledge in Physick, got by practice only.*
Empiric, *Such a Physitian who hath no Judgment, but has all his skill from practice, or by experiments.*

Empyema,

The Table.

- Empyema**, *An Imposthume or collection of corrupt matter with inflammation between the breast and the Lungs.*
- Empyreuma**, *A smatch or taste of the fire, as burnt too, or as in most waters newly drawn off by distillation.*
- Emulgent**, *Vessels or Arteries, or veins: two large Arteries so called springing out of the great Artery, which being carried near to the back bone are inserted into the Reins. Also two large Veins which springing out of the Vena Cava under the Ventricle, are carried into the Kidnies.*
- Emulging**, *to any place.*
- Emunctories**, *Sinks or cleansing places for the Body.*
- Encephalon**, *The head and all its parts.*
- Enema**, *A Clister.*
- Energy**, *The force or operation, or virtue of a thing.*
- Enervation**, *Unnerving, or a loosning of the strength, a weakning or making feeble.*
- Enthymia**, *Medecines used to express the flowing of the Blood or other humours*
- Enthymeta**, *to any place.*
- Ephemera**, *Things of a days lasting: A short Feaver of a day.*
- Epidemical**, *General, universal, publick.*
- Epidorisis**, *A sudden sweat beginning about the head and breast passing over the body, unprofitable and of small use for that evacuation of the disease: Sometimes taken for sweating.*
- Epigastric**, *Belonging to the Epigastrium.*
- Epigastrium**, *The same with Abdomen, or the outward part of the Belly, from the Navel to the privy members.*
- Epilepsie**, *The Disease called the Falling-sickness.*
- Epiphysis**, *Is an addition of some bone of a different description to the true bone to which it is annexed: an addition or augmentation.*
- Epispasticks**, *Certain Medecines used for the drawing forth of ulcerous matter.*
- Epithema**, *Moist Medecines used to bathe or foment the parts affected.*
- Epithymum**, *Dodder of Time, used to purge Melancholy.*
- Equinox**, *When the day and night are of an equal length, about the twelfth of March, and the twelfth of September.*
- Eradicated**, *Rooted out.*
- Erratic**, *Creeping, wandring, or straying.*
- Escharotic**, *A Plaister or Salve to heal up a wound, and to bring it to a Crust.*
- Etymology**, *The true Exposition or interpretation of a thing.*
- Evident**, *Plain, clear, manifest.*
- Eventilated**, *Fannowed, or that receives wind.*
- Euphorbium**, *The Gum of a certain Tree so called.*
- Excandescency**, *A growing very hot and burning.*
- Excern**, *Thrust out, to purge, or sift forth.*
- Excrementitious**, *Belonging to Excrements: filthy, polluted.*
- Excretion**, *A voiding the Excrements, or Superfluities of the body.*
- Excretory**, *To such a thing belonging, that puts forth the Excrements of the body.*
- Excrecencies**, *Things that grow forth out of the body, or any other thing besides the body, or thing, as Warts or pieces of flesh.*
- Exert**, *To shew or put forth.*
- Exitition**, *A sparkling, boiling, bubbling, or leaping up, or forth.*
- Exonerate**, *To disburden, or discharge, to purge forth.*
- Expansion**, *A stretching forth, spreading abroad, or enlarging.*
- Expanded**, *Spread out at large, or stretched forth.*
- Expatriated**, *A running forth or about, enlarged.*
- Explosion**, *A driving forth with violence.*
- Exploded**, *Thrust forth, or driven out.*
- Extravasated**, *Put, or let forth of the Vessels as Blood out of the veins.*
- Extraneous**, *Strange, or of another kind.*
- Extirpated**, *Rooted out, or plucked up by the Roots.*
- Extricated**, *Delivered, or unintangled.*
- Exuberances**, *Swellings forth, or risings up, in the flesh or other parts.*

F

- Faces**, *Dregs.*
- Faeculencies**, *Dregs or settlements.*
- Farciments**, *Stuffing or fillings of any thing.*
- Fermentation**, *A fermenting or working, like leaven.*
- Fibrils**, *Little small strings of Fibres, or of the Nerves or Veins.*
- Fibres**, *The hairy strings of the Nerves and Veins.*
- Fibrated**, *That has small and hairy strings.*
- Filaments**, *Little, thin, slender Rags like threads, such as appear in Urine.*
- Filter**, *To strain: A Strainer.*
- Fissures**, *Clefts, chaps, or divisions.*
- Fistulous**, *Belonging to a Fistula, or sore running Boil.*
- Flatulent**, *Windy or full of Wind.*
- Flatuous**, *to any place.*
- Fluor**, *A Flux.*
- Fluid**, *Flowing or running.*
- Fluidity**, *Apt to flow, flowing or wetness.*
- Fornix**, *An hollow place in the Brain, bending like an Arch.*
- Forum**, *A place in Rome where Judgments were given, and causes decided.*
- Friable**, *That may be rubb'd to powder between the Fingers.*
- Frictions**, *Rabbings.*
- Fuliginous**, *Sooty, or belonging to Soot.*

(b)

Functions,

The Table.

Functions, *The Exercises or discharging of some Offices.*

Fuse, *To melt as Mettals.*

Fused, *Melted or running, as Mettals made liquid.*

Fusion, *A pouring forth, also a melting of Metals or other things.*

G

Ganglia, *Things like the heads of Mushrooms in the body.*

Ganglioform, *Of the shape of Ganglias, or the heads of Mushrooms.*

Galen, *An ancient learned Physitian.*

Gargarisms, *Medecines to cleanse the mouth and Throat, and to wash them from filth.*

Genesis, *Beginning, Nativity, or Generation.*

Genuine, *True or natural.*

Germination, *A springing or budding, or sprouting forth, as of Trees in the spring.*

Gesticulation, *A wanton moving up and down of the Legs and Arms or other parts of the body, like a Tumbler or Mimick.*

Glandulas, *Are little round Kernels everywhere up and down in the flesh and other parts.*

Glutæi, *Muscles of the Thigh.*

Gonorrhea, *The running of the Reins, a flux of seed or matter at the privy parts of man or woman.*

Grumous, *Clottery like blood when congealed.*

H

Hæmorrhage, *An excessive flux of Blood at the nose or elsewhere.*

Halos, *A Circle about the moon or stars.*

Hellebore, *The root of an herb used in Physick, two sorts, white and black.*

Heptic, *Belonging to the Liver, and a Medecine proper to cure the diseases of the Liver.*

Hermodactils, *Or Mercuries finger, white and red, used in Medecines.*

Heterogeneous, *Of an other kind or Genus, strange, not agreeing.*

Homogeneous, *Of the same kind or Genus, agreeable, and sorting.*

Horizon, *The Circle of the Firmament, terminating our sight.*

Humid, *Moist, wet.*

Hydropic, *That hath the Dropsie, or belonging to the Dropsie.*

Hydrotic, *A medicine evacuating watery humours.*

Hydragogues, *Medecines that will draw forth the watery humour of those who have the Dropsie.*

Hyocides, *A forked bone like the letter Y, so called of the Anatomists, consisting of divers small bones which are the ground or foundation of the muscles of the Larynx, and the Tongue, and helps to breathing, and swallowing down meat and drink.*

Hypercatharsis, *Overpurging, or in extreme.*

Hypochondria, *The Præcordia: The forepart of the Belly and sides about the short Ribs and above the Navel, under which lyeth the Liver & the spleen.*

Hypochondriac, *A windy Melancholy, bred in the Hypochondria, from whence a black phlegm arises that infects and troubles the mind, one troubled with such melancholy.*

Hypnotic, *A medecine that causeth sleep.*

Hypogastrium, *The lower part of the Belly, which reaches from the Navel downwards to the privy parts.*

Hippocrates, *A learned ancient Physitian, and the first methodizer of Physick, and made it Artificial.*

Hippocrates sleeve, *Along woollen straining bag, sharp at the bottom, so called, being almost in fashion of a sleeve or Doublet.*

Hypothesis, *An argument or matter about which one may dispute.*

Hypostasis, *A substance or settlement, such as is in the bottom of an Urin.*

Hysterical, *Belonging to the womb or mother, or troubled with the disease called the Mother.*

I

Jalap, *A purging Drug.*

Ichor, *The matter or corruption running forth of a sore or Ulcer.*

Idocrasie, *The proper disposition or temperament of a thing or body.*

Idiosyncrasie, *The property of the Temperament of Bodies.*

Idiopathic, *Belonging to the proper passion of a disease, thing or body.*

Idiopathy, *The proper passion of a disease.*

Idea, *The form or figure of a thing conceived in the Imagination.*

Ilion, *The third Gut from the Ventricle, wherein the digested food or Chyle waxing thicker begins to rest; the thin Gut or small Gut.*

Iliac, *Belonging to the Colick; The Colick in extremity. Iliac passion.*

Imbecillity, *Weakness, feebleness.*

Impervious, *That cannot be passed or gone thorough.*

Impetigo, *A certain kind of dry Itch or scurf like the Leprosie.*

Impetuous, *Violently or with force, as it were rushing upon a thing.*

Impregnated, *Filled full with the vertue of a thing, as when any thing is infused in a liquid body, communicating its vertue to it.*

Inanition, *Emptiness.*

Incitement, *A stirring up or provoking.*

Indication, *A shewing or manifesting by sign.*

Indomitable, *Untamable, that cannot be subdued.*

Inflated, *Blown or puffed up as a Bladder with wind.*

In-

The Table.

Ingestion, *A putting or pouring into a thing, as meat and drink into the stomach.*
 Inguinal, *belonging to the Groin.*
 Inordination, *Disorderings, irregularities, or out of order.*
 Insipid, *Without taste or smack.*
 Inspiration, *A Blowing in, or a drawing in of the breath.*
 Intense, *Strong, Violent, Great.*
 Intercostals, *Between the Ribs, Nerves, so called, because descending from the brain, they run between the Ribs, and so descend to the Inwards.*
 Internodia, *Between the joynts or knots, as the spaces in a Ratoon Cane between the joynts or knots.*
 Interstitia, *The spaces between other distances as the spaces between the Ribs, or the joyntings of the back-bone.*
 Internunciis, *A messenger that goes between.*
 Intestines, *The entrails or the Guts.*
 Intrinsical, *Inward.*
 Inverse, *Aturning inside out, or outside in, upside down, quite contrary.*
 Inverted, *Turned wrong-side out or upside-down; quite changed from its natural scituation.*
 Involuntary, *Not with the will, unwilling.*
 Irradiation, *A beaming forth or casting forth beams like the Sun. Sometimes applied to the spirits beaming themselves forth, or running forth from their centre like beams.*
 Irrigation, *A watering, wetting or moistening.*
 Irritate, *To provoke, anger, or stir up.*
 Irritated, *Provoked, anger'd, or stirr'd up.*
 Ischuria, *The disease of the Bladder; the stoppage of the water, when it cannot come forth but by drops and with pain.*
 Ischuretical, *one so troubled with that distemper.*
 Jugular, *Belonging to the Throat, the throat-vein and Artery.*
 Julap, *A cooling Cordial, or a mixed Potion to cool and refresh the heated spirits, used in Fevers.*

L

Lactiform, *Like milk, or in the form of milk.*
 Languor, *Feebleness, failing or decay of strength, fainting, or weakness of Spirits.*
 Larynx, *The top of the Asper Artery, or the head thereof, which reacheth up to the Mouth or Jaw, which with the bone Hyoides joyn'd thereto, serves for breathing and forming of the voyce, or the air into articulate sounds.*
 Lassitude, *Weariness and irksomness.*
 Lateral, *Belonging to the side.*
 Latex, *Liquor or Juice of any sort in the body.*
 Laudanum, *A Medecine used by Physicians to cause rest, given in difficult Cases.*
 Lienary, *Belonging to the Spleen.*
 Leipothymy, *A swooning or fainting away of the spirits.*

Lethiferous, *Deadly, that causeth death.*
 Leucophlegmacy, *The kind of Dropsie that ariseth of white Phlegm throughout all the body, and makes the flesh spongy.*
 Ligature, *A band or string bound hard about the Arm, Leg or any other part of the Body.*
 Limature, *The powder or dust that cometh of filing, the filings of Steel and other mettals.*
 Limpid, *Clear, pure, and bright like water.*
 Linctus, *A Medecine that is to be lick'd with the Tongue.*
 Liniments, *Ointments.*
 Lixivial, *Belonging to lie made of ashes.*
 Lobes, *Lappets, or such as the Liver is distinguished into.*
 Lochia, *All that comes away from a woman after she is brought to bed.*
 Locomotive, *That moves from place to place.*
 Lucophlegmacy, *See Leucophlegmacy.*
 Lumbar, *Belonging to the loyns.*
 Luxuriat, *To grow rank or abound.*
 Limphic, *Vessels: That carry or contain the*
 Limphatic, *waterish humours of the body.*
 Limpheducts, *Water-Carriers, or Conveyors, the same sort of Vessels which carry forth the waterish humours.*

M

Magma, *The blended drops and faces of several Mettals, as also of Chymical Extractions.*
 Mammillary, *Processes in the Temples, Bones hanging down like broken brows of Banks representing the fashion of Teats and Cows Udders.*
 Mansorius, *A Muscle, which springing up circularly from the Throat bone of the*
 Massoterie, *upper Jaw, moveth the nether Jaw.*
 Mandible, *The Jaw wherein the Teeth are set.*
 Mastic, *A certain Medicinal Gum.*
 Masticator, *The Pipe or Conduit that conveys the pituitous matter out of the Head into the Mouth.*
 Matrace, *A Vessel used for Chymical Distillations.*
 Maturation, *A ripening.*
 Maxillary, *Belonging to the Jaws.*
 Maxillar, *Belonging to the Jaws.*
 Mechoacan, *A purging Drug brought from the Indies.*
 Mecorium, *The juice of the Leaves and heads of Poppy.*
 Medastinum, *Or Mediastinum: The thin membrane that divides the middle belly or the Breast, from the Throat to the Midriff into two bosoms or hollows: One on the right side, the other on the left.*
 Medullar, *Marrowy, or belonging to the marrow or pith, or the white substance of the Brain.*
 Membranes, *The little thin skins joyning the bones and sinews together in several parts of the body: The upper thin skins of any part.*
 Meninges, *The thin skins that enwrap the Brain,*
 (b 2) both

The Table,

both of the pia mater & dura mater: one called the hard, the other the soft *Meninges*.

Menstruum, A preparation made by Chymists to dissolve metals, also to extract tinctures and the virtues of medicinal druggs, woods, flowers, herbs, &c.

Mesentery, A certain thick fat skin, or the double skin that fastens the bowels to the back, and each to other.

Meseraic, Veins arise, or are rather inclosed in the Mesentery, being branches of the great vein, by which the Guts are nourished, and the juice of the meat concocted, is conveyed to the Liver to be made blood.

Mercurie, Quick-silver, and its preparations of it.

Metaphysical, Supernatural; things of sublime speculations beyond nature.

Metastasis, Is a translation, or when a disease removes out of one place into another.

Metathesis, Is transposing, the putting of one thing for another.

Miasm, Infection or taint.

Microscope, A Perpective-glass to behold minute, and very small bodies, a Magnifying glass.

Millepedes, The hundred-footed Creature, and Hogs-sows, or Hog-lice.

Mirabolans, A certain medicinal fruit brought out of the Indies.

Modifications, A measuring or bringing into measure.

Morbid, Sick, corrupt, filthy, or naughty.

Morbifick, That causeth the Sickness or disease.

Mucilage, Thick boiling up of a thing to a jelly, or thick consistency.

Munited, Defended or fortified.

Muscle, Parts of the body that serve for motion, softer, and more fleshy than the sinews.

Musculous, Full of Muscles, or belonging to the Muscles.

Myology, The Doctrine of the Muscles.

N

Narcotick, Stupifactive, or that makes the part senseless.

Nates, Two prominences in the Brain, so called because in the form of Buttocks.

Natiform, In the form of a Buttock.

Neoterics, People or men of late Times.

Nepenthe, A drink to drive away melancholy.

Nephritis, A pain in the reins of the back, also the Stone or Gravel in the Reins.

Nephritic, One troubled with the pain in the Reins.

Nerves, Are the sinews which convey the spirits that serve for life and motion through the whole body.

Neurologie, The doctrine of the Nerves.

Nitre, That is usually called Saltpetre: A salt taken out of the earth.

Nitrosulphureous, Nitre mix'd with Sulphur, or of a nitrous and sulphureous nature or quality.

O

Oblique, Cross, traverse, aslope, not straight or right.

Oblong, Longish or somewhat long.

Oeconomie, A certain order of doing any thing, an household rule, regiment or governance.

Oesophagus, The mouth of the stomach.

Olibanum, An ourlandish Gum.

Opiologie, The doctrine of Opium.

Opium, Made up of the juice of wild poppie, used to stupifie and bring into a senseless sleep.

Opiats, Medicines made of Opium for some part if its ingredients to cause sleep and ease for pains.

Optic, Belonging to the sight, as the Nerves that bring the vertue of seeing to the eyes.

Opopanax, The juice made of a certain herb.

Ophthalmic, A medicine to cure the diseases of the eyes.

Orgasm, Rage or fury.

Orifice, The hole of a wound, or the mouth of any thing.

Origine, Beginning, rise or birth of a thing.

Orbicular, Of a round form or shape.

Orthopnoea, Is such a straitness of breath, that one cannot breath, or fetch breath without stretching out of the neck, or holding it upright.

Os Pubis, Is the bone at the bottom of the belly, just above the privie member.

Os Sacrum, Or the sacred bone, is the great bone upon which the end of the ridge or back-bone resteth.

Oviparous, Egg-bearing Creatures, or that lay Eggs.

P

Panacea, All-heal, or a plaister or medicine to heal all things.

Pancreas, Called in a Hog the Sweet-bread. It is a remarkable kernel placed below the Ventricle, and serves for a division of the Vena porta, as also to defend the Ventricle from touching the back.

Papillary, Belonging to the Teats, or like paps or teats of a dug.

Papillæ, Little paps, or little pieces of flesh in the body, so called of the shape of paps.

Paracentesis, Is an incision made to draw forth the water from those swelled with the Dropsie, vulgarly called a Tapping.

Paracelsus, A famous Dutch Emperick.

Paradox, A thing contrary to the common opinion.

Paralytick, That is troubled with the Palsie.

Parallel, Equal, alike, like a line drawn to write by another.

The Table.

- Parotida, } The two chief Arteries and Veins on
Parotides. } the right and left side the throat,
going up towards the ears.
- Parotid, To them belonging.
- Particles, Little parts or portions of any thing.
- Paroxisms, Fits, or the returns of fits, as of an
Ague or Fever.
- Pathetic, To passion belonging, Nerves so called
by Dr. Willis.
- Pathologie, The doctrine of the passions, also as
Aetologie.
- Pathognomic, { That moveth the affections, or
Pathognotic, { that properly belongs to the
thing.
- Pepasmus, A kind of a concoction of the humors in
the disease.
- Percolation, A straining thorow.
- Pericardium, The thin skin or membrane covering
the whole heart like a case.
- Peritonæum, The inner skin or rim of the belly
joynd to the Caul, wherewith all the Intrails are
covered, called by the Anatomists Siphach.
- Peripneumonia, An Inflammation or Impostume of
the Lungs, with a shortness of breath.
- Peristaltick, Motion, a certain motion compassing
about as in certain convulsions.
- Perspiration, Breathing thorow, as sweat through
the pores of the body.
- Perturbations, Disturbings, vexing troubles, dis-
turbances.
- Pervious, That may be passed through, or that
has a passage or way through it.
- Peruvian, Belonging to the Country of Perue, as
Peruvian, Balsom thence brought.
- Pharmacy, The Medicines of the Apothecaries; or
the art of making them up.
- Pharmaceuticks, The part of Physick that cureth
with Medicines.
- Phænomena, Appearances of things.
- Philonium, A Confection made of many ingre-
dients compounded together.
- Philtre, A potion to cause Love; or poysonous
Medicines that operate magically, or not natu-
rally.
- Phlebotomie, Letting blood or opening of a
Vein.
- Phlegmon, An inflammation of the blood, with a
red swelling.
- Phlegosis, The like Inflammation fiery red.
- Phthisis, The Consumption of the Lungs, with a
wasting away.
- Phthisic, Belonging to that disease, or that has
it.
- Physiologie, The reasoning of the Nature of a
thing, or the searching it out.
- Pia Mater, The thinner inward soft skin that in-
wrappeth the pith and marrow of the brain, and
is every where joynd to it; called the thinner and
soft Meninx.
- Pica, The longing disease of Women with Child.
- Pineal, Kernel in the brain, in form of a Pine-
apple, called also Conarium.
- Pituitous, Snoty thick phlegmatick matter.
- Plastic, Formative or that worketh and formeth.
- Plenitude, Fulness or store.
- Plethora, A fulness or plenty of humours in the bo-
dy, good or bad.
- Pleura, A skin or membrane which clotheth the
ribs on the inside, which being inflamed by the
blood, causeth the Disease called the Pluri-
sie.
- Pneumatic, Windy or belonging to wind or breath.
- Pneumonic, One sick of the disease of the Lungs.
- Polypus, A filthy disease in the nose, breeding
stinking and ulcerous flesh within the nostrils.
- Pontic, Belonging to the Sea or to the Country of
Pontus.
- Porta Vena, Is a Vein that hath many small
roots fastened to the Liver; from whence arising
grow into one trunk or stock, which going forth
from between two eminent lobes of the Liver,
passes into the Gall, Ventricle, Spleen, Me-
senteries, and Caul, and other parts of the
body.
- Pores, Are the little small holes or breathing
places in the skin of the body, through which heat
and moisture insensibly breath continually.
- Porous, Full of such like holes or pores.
- Praxis, Practice or action.
- Præcipitation, A casting down; used by the Chy-
mists for a certain way of distillation, when the
matter is thrown back into the receiver.
- Præternatural, Besides or more than natural; not
natural or besides nature.
- Præceding, Going before.
- Prævious, That went before.
- Præcordia, The parts about the heart, as the Dia-
phragma, or midriff separating the heart from
the other bowels.
- Præmised, Sent before, or before made known.
- Præpolency, Of very great force, strength, excel-
lency, or virtue.
- Priapismus, Is a disease in the Yard, that causeth
it alwayes to be stretch'd forth, and extended
without any thing provoking it.
- Primigenious, The first original; not having its
beginning or birth of another.
- Procatartic, Remote, not next cause of a dis-
ease.
- Processes, The parts of a bone (or other parts)
that exceed the natural height or posture, and are
yet dependances of the bone and parts, and pro-
ceed or go out from it; as also some Nerves going
forth of other Nerves, being still parts of the
main stock.
- Profusions, A pouring forth, a running or spread-
ing abroad.
- Profluvium, A flowing of humors, a gushing forth
in abundance, a flood.
- Profligated, Driven away, or overthrown, discom-
fited.
- Prognosis, The præsience or fore-knowledge, or
Prognostication of the event of the disease.
- Promptuary, A Store-house, or place where any
thing is laid up.
- Prominences, Bunchings forth, those parts that
notably shew themselves above the rest, as a hill
in a plain.
- Prophasis, The appearing or shewing of a thing.

The Table.

Prophylactic, *That part of Physick that preventeth and preserveth from diseases.*
Frostatae, *Kernels in the Groyn, or about the privie-members.*
Protension, *A stretching forth at length.*
Protraction, *A drawing forth at length, also a prolonging.*
Protuberance, *A bunching forth above the rest.*
Protrusion, *A thrusting forward.*
Psoa, *A great muscle beginning at the 11th. rib and going through the bowels to the privie-members.*
Psoa, *The scabbado, or scabbiness with pustles.*
Ptyalismus, *Sallivation, or a great flux of spitting.*
Ptisan, *Decocted Barly, with other ingredients.*
Puretology, *The doctrine, or a discourse of Feavers.*
Pungitive, *Pricking like needles.*
Purulent, *Full of matter or filthy corruption; as a Bile or Impestone.*
Pubis, *That part of the privie-parts where the hair grows.*
Pulsific, *That strikes as the Pulse or beating of the Arterie, or that causes such striking or pulse.*
Pylorus, *Is the lower mouth of the stomach or ventricle, whereby the meat being digested, is transmitted into the Stomach-gut or Maw-gut.*
Pyramidical, *Of the shape or form of a Pyramide, broad at bottom and sharp at the top.*
Pyretology, *The doctrine of Feavers, or of fire.*

Q

Quotidian, *Daily or every day: an Ague that comes every day.*

Quartan, *Every fourth day; an Ague that has two days of intermission, and comes on the fourth day again.*

R

Ramifications, *Branchings forth like the Veins, Arteries and Nerves up and down the body, resembling the small twigs and branchings of Trees.*

Rarefaction, *a making of any thing rare or thin.*

Ratiocination, *Reasoning, debating, or arguing of any thing, or the facultie of reasoning.*

Reciprocation, *a returning back, or a mutual partaking of a thing, or depending on another by a mutual consequence.*

Recrement, *Any superfluous matter, or thing in the blood or body, or any of the parts.*

Redundancy, *Superfluity; overflowing too much of a thing.*

Recesses, *The private and hidden parts of the body or any hid place.*

Refection, *A repast of meat and drink, a refreshing.*

Refraction, *A breaking off, or rebounding back.*

Reflection, *A bending back or rebounding.*

Refrigerate, *To make cool, or to refresh with cooling; as fanning one in great heat.*

Regurgitate, *To swallow up again; or to sup up again what it before had parted with.*

Regulus, *The dross of metals.*

Renal, *Belonging to the Reins.*

Reiterated, *Repeated, or the something done or performed again.*

Remora, *A stop, let, or stay to any thing; a figurative speech taken from a little fish so called, which is said by cleaving to the keel of a ship, to stay it in its course.*

Repletion, *A fulness or filling full, or abounding.*

Repullulate, *To bud or spring forth again, as trees in the Spring.*

Resine, *A Chymical extraction of several druggs so called being in substance like to Rosine or Resine.*

Respiration, *A breathing forth or a venting.*

Resolution, *A dissolving or unbinding, a loosning.*

Retort, *A Chymical Vessel.*

Reverberatory, *A furnace by which matter is calcined or consumed with the flame.*

Rhomboides, *A Geometrical figure with unequal sides.*

Rhombus, *A Geometrical figure with equal sides but not right angled, like a quarry of glass.*

Rhubarb, *A root brought out of the East-Indies, almost like a dock root, used to purge choler.*

Risibility, *Laughter, or the faculty of laughing.*

Riverius, *A famous Physician.*

Rotation, *A going round like a wheel, a moving round.*

Rudiments, *the first beginnings and principles of thing:.*

S.

Saline, *Saltish or belonging to Salt.*

Salt-peter, *Or Salt of the Rock: a salt got out of the Earth, contracted from several dungs of Fowls or other Creatures, as Pigeons, Poultry, and Cattle, and from the Urines of Beasts, and is one of the Ingredients of which they make Gunpowder, much used in Chymistry.*

Sal-prunella, *A Salt made out of Salt peter.*

Sal-ammoniacus, *A Salt of the Earth, found among the Sands in Lybia.*

Sal alcali, *Salt of ashes made of the herb Kali, but used also for the salt of other herbs burnt to ashes and so extracted.*

Salvatella, *Vein, is a branch, which springing out of a Cephalick Vein, in the outside of the Cubit, stretcheth above the wrist and extreame part of the hand, between the Ring-finger and the little finger.*

Salivate, *To spit or cause one to void much spittle.*

Salivation, *A great flux of spitting, or voiding of spittle more than ordinary at the mouth.*

Sanguineous, *Bloody or belonging to the blood.*

Sanguification, *The making of blood, or the changing the nourishment into blood.*

Sanguiducts,

The Table.

- Sanguiducts,** *The Vessels that carry the blood through the body, as the Veins and Arteries.*
- Sarsaparilla,** *A drugg brought from the West-Indies, used in many decoctions.*
- Sagapenum,** *A kind of Gum or Rosin that runs forth of the Shrub called Ferula.*
- Scammony,** *The juice of an herb which violently purgeth choler; it is also called Diagridium.*
- Scapular,** *Muscle; a muscle belonging to the shoulders, and serves for the moving of them.*
- Scheam,** *Is a figure or draught of a thing; also taken for an Astrological Table of the 12. Houses.*
- Schirri & Scirri,** *Are hard swellings in the flesh, without pain but hardly curable.*
- Schirrous,** *Full of such hard swellings.*
- Sclerotic,** *That is troubled with some tumour in the third panicle of the eye, called the Cornea membrana, or somewhere thereabouts.*
- Scorbutick,** *That is troubled with the disease called the Scorbute or Scurvey.*
- Scordium,** *A useful herb in Physick, having leaves almost like Germander.*
- Scotomies, Scotomie,** *Turnings round; a disease in the head, when all things seem to turn round.*
- Scrotum,** *The outward skin of the Cods, where the hair grows.*
- Scutiform,** *In the form of a Shield or Buckler.*
- Sedal,** *Veins in the Fundament.*
- Seclusion,** *At thrusting forth or out.*
- Secundine,** *The After-birth, or that which inwraps the Child, which follows after the Birth of the Child; vulgarly called the After burthen; of Anatomists the 4th. membrane of the eye, called Chorion; and that first clotheth the optic sinew is called the Secundine.*
- Secretion,** *A separating or putting apart.*
- Secreted,** *Separated apart.*
- Senna,** *Or Sena, the leaves of a Plant, that Purgeth Phlegm, Choler and Melancholy.*
- Sensory,** *The organ of feeling, or discriminating by the senses; the common sensory or seat of such organ, placed in the brain.*
- Septic,** *That hath the force of corrupting or putrifying, or that maketh rotten or ripe the matter in a sore.*
- Series,** *An order, course, or succession of things, a row or course of things orderly one after another.*
- Serous,** *Humour, the whey or watery humour that accompanieth the blood, and which makes it fluid, and is separated and put off from the blood into the parts of the body.*
- Serosities,** *Such serous humours abounding.*
- Serum,** *The whey or watery humour of the blood, the substance of the serous humour.*
- Sinus,** *A bosom or hollow turning, or outlet of waters or an inlet or arm of the Sea.*
- Soldanella,** *Is the Sea-colewort or Folefoot.*
- Solitive,** *Loosening, or that maketh the body loose.*
- Solstices,** *Are two, the Summer and the Winter solstice; the first is about the twelfth of June,*
- when the Sun is nearest to us and makes with us the longest day; the last is about the 12 of December, when the Sun is at its greatest distance from us, and makes with us the shortest day.*
- Solving,** *Loosening or unbinding.*
- Solution,** *A loosening or weakening, as of the Nerves or joynts.*
- Solvent,** *That which dissolveth or openeth the parts of the matter to be wrought upon.*
- Spagiric,** *Belonging to Alchymie, or to the Chymical art.*
- Spasms,** *Cramps or Convulsions of the Nerves.*
- Spasmodic,** *Belonging to the Cramp or Convulsion, or hauling of the sinews.*
- Spasmology,** *The doctrine of the Convulsion or Cramp of the sinews.*
- Speculative,** *Contemplative or notional.*
- Speculation,** *A seeing or discovering a thing by contemplation.*
- Species,** *A kind more particular than Genus, and maybe communicated to more generals; as a Cow and an Horse are of a different species, but both Animals or Beasts.*
- Spermatic,** *Belonging to the sperm or seed,*
- Sphacelismus,** *A blasting or a mortification of a part.*
- Sphincter,** *Is the round muscle that encompasses the mouth of the Arse gut, which keeps the excrements from an involuntary coming forth.*
- Spine,** *The back-bone, or long-joynted bone that goes down the back.*
- Spina dorsii,** *The same; the bone of the back, the Chine.*
- Spinal,** *Belonging to that bone.*
- Spiral,** *A turning about, and as it were ascending.*
- Splanchnic,** *Belonging to the Spleen.*
- Splanchnical,** *Belonging to the Spleen.*
- Splenitic,** *Troubled with the disease of the Spleen.*
- Spodium,** *A sort of soot made out of the making and trying of brass.*
- Spontaneous,** *Willingly or of one accord, or by the command of the will.*
- Sporadical,** *That seizeth not after an usual manner, diseases that seize privately here and there on People dispersedly, not generally or epidemically.*
- Squinancy,** *Or Squincy, is a swelling in the throat, with an inflammation.*
- Stagmas,** *The mixtures of mettals, or other Chymical things set together to ferment and operate one upon the other.*
- Stagnation,** *A standing still without motion, as a pool.*
- Sternothyroecidal,** *Muscle, A Muscle which reaches from the Sternon to the Os Pubis.*
- Sternon,** *That part of the breast where the ribs meet.*
- Stibium,** *Antimony.*
- Stiptic, Or Styptic,** *that straineth, bindeth, or is restrictive.*

The Table.

Strumous, *That belongeth to the Kings evil, or he that hath that disease.*
Subclavian, *Vessels: the vessels that belong to the little ribs of the breast.*
Sublimate, *White Mercury, or Quick-silver Chymically sublimed; Mercury sublimate: of a poysonous nature.*
Subside, *To sink down or fall to the bottom.*
Subsidiare, *That cometh for aid, or to help, or bringing aid or help.*
Subaction, *A kneading, working, exercising, or bringing under.*
Suffusion, *A spreading abroad, or pouring forth.*
Sudation, *A sweating.*
Sudorifick, *That causeth sweating.*
Sulphur, *Brimstone which is found in Mines in the Earth, taken also for one of the Chymists principles.*
Sulphureous, *Brimstone, or belonging to Brimstone.*
Superficies, *The outside or overmost part of any thing.*
Suppuration, *A ripening or gathering together of the matter of a sore.*
Surculs, *Little or small shoots or spriggs.*
Sutures, *The joinings together of the bones of the head, which appear as if sowed together with long stitches.*
Symptom, *Is an effect, accident or passion following any sickness, or any sensible grief joynd with a disease, besides the disease it self, as Head-ach with a Fever.*
Sympathy, *Is a natural passion of one thing to another, or an agreement in qualities.*
Sympathic, *Agreeing in affections or passions.*
Symphony, *A consent or agreement in harmony.*
Sympraxis, *A joynt exercising or agreement in practice or action, a consent in operation.*
Syncope, *A swooning, or a loss of all sense.*
Synochus, *Is a Fever without changes or intermissions, a continual Fever.*
Synthesis, *A figure contrary to Analysis; a concession of some things arising from the matter.*
Systasis, *Constitution.*
System, *The work or part of something that is constituted or a theam or work compacted of several parts, a part of which is a System.*
Systole, *Is the motion of the heart and arteries, contrary to Diastole, by which they are contracted, but by this they are dilated.*
Syzygies, *Are the Nerves that carry the sense from the brain to the whole body; also the conjunctions of the Sun, Moon and Stars.*

T.

Tabes dorsalis, *The mourning of the Chine; a wasting or consumption of the back.*
Tabid, *Consumptive, pining, or wasting.*
Tamarinds, *An outlandish fruit, good to quench thirst and to allay the heat of choler, used in Medicines.*

Tarantula, *A little venomous creature found in Apulia, a part of Italy, whose poyson being by biting diffused through the body, strikes the Nerves with strange tumors and Convulsions, which is only curable by the party so bitten, being provoked to continual dancing, by which means the poyson is evacuated through the pores from the Nerves.*
Tartar, *Is a concreted matter taken from the Lees of Wine, very medicinable.*
Tenacious, *Holding or cleaving fast.*
Tenasm, *A great desire of going to stool, and yet can do nothing.*
Tenous, *Thin, slender, or small.*
Tendons, *Certain parts in the top of the Muscles, which serve aptly for the moving the muscle, being the lodging place of the animal spirits, belonging to the Muscle, and out of which they issue into the muscle; they are harder than the muscles, yet softer than a gristle or ligature.*
Terrestrial, *Earthly, or belonging to the Earth.*
Testes, *certain tubercles in the brain of a man and beasts, so called because like to the Stones of a man.*
Tetanism, *A kind of Cramp that so stretcheth forth the member that it cannot bow nor bend any way.*
Texture, *Frame or make of a thing.*
Theorie, *Contemplation, or speculative knowledge of a thing.*
Theriacal, *Or Treacle, a Medicine of a diverse composition invented against poysons.*
Therapeutick, *The curatory art of medicine, or that which belongs to the curing part.*
Theorem, *An Axiom respecting contemplation.*
Thesis, *A position or a general question or argument to be discussed.*
Thorax, *The breast or the middle part of the body, reaching from the throat or neck to the lower ribs.*
Thoracious, *Belonging to the Breast or Thorax, or medicines good to help the disease of the Thorax.*
Tinged, *Dyed or dipped, or that has received a colour.*
Tincture, *A dying or colouring, or the dye or colour of any thing. It is used also for high Cordials and Chymical medicines, of a liquid substance, and stained with some tincture or colour.*
Tolutan, *Balsom: A Balsom brought from the Indies, so called.*
Topics, *General places or heads for invention; a part of Logick, noting the places of Invention.*
Torpedo, *The Cramp-fish that benummeth the hands of the Fishers, holding the Net or Angle with a subtil poyson.*
Torpor, *A numbness, heaviness or stiffness and unaptness for any motion.*
Torrid, *Dry, burned, or parched.*
Torried, *Made dry or parched, or burnt or scorched.*
Trachea, *The Weasand or Wind-pipe; the sharp arterie.*

Tragacanth,

The Table.

- Tragacanth,** *An outlandish Gum, commonly called Gum-dragganth.*
- Transpiration,** *A breathing through as a vapour through the pores.*
- Transpire,** *To breath through, as the humors insensibly through the pores of the skin.*
- Trapezial,** *Belonging to a Geometrical figure, so called of four sides.*
- Troches,** *Are little round Cakes made up of powders, and used in medicines.*
- Trochlear,** *Muscle: A muscle made almost like a windlass or pulley, whereby things may be strongly hauled or pulled.*
- Tropicks,** *Two great imaginary Circles in the Heavens, being of equal distance from the Equator, the one called the Tropic of Cancer, to which the Sun being come, he returns back towards the Tropick of Capricorn; to which being come here again, returns towards the Tropic of Cancer; being the limits of the Suns progress.*
- Tubes,** *A Mathematical Instrument, hollow like a pipe.*
- Tubercles,** *Little swellings or pushes, weakles or weales in the skin or flesh.*
- Tubuli,** *Small little pipes, the Veins and very small Arteries, or little hollow parts of the bowels so called.*
- Tumified,** *Swelled or puffed up.*
- Tumor,** *An hard rising or swelling in any part of the body, with or without inflammation.*
- Turbith,** *A root much used in Physick to purge phlegm.*
- Turgency,** *A swelling or rising up.*
- Turgescency,** *A swelling or rising up.*
- Turgid,** *Swelled or risen up, puffed up, moved very much.*
- Tympany,** *A kind of dry Dropsie, or windy swelling of the belly, gathered between the peritoneum and the bowels, which if it be smitten upon, soundeth almost like a Drum.*

V.

- Valves,** *A part of the brain, made like folding doors so called.*
- Van Helmont,** *A Famous Dutch Doctor.*
- Vapid,** *Dead, decay'd, without tast or smack.*
- Vegetation,** *A growing or putting forth, or flourishing as a Plant.*
- Vegetal,** *Belonging to such a growing or flourishing.*
- Vegetable,** *That which hath life, and growth, but not sense, as herbs and trees.*
- Vehicle,** *That which carrieth or beareth another thing as the blood is of the animal spirits.*
- Vena Porta,** *See Porta Vena.*
- Vena Cava,** *See Cava Vena.*
- Venous,** *Belonging or appertaining to a Vein.*
- Ventricle,** *Is the stomach, or that part which re-*

- ceives the meat and drink, being swallowed down, and which hath in it self the virtue of digestion.*
- Ventricles,** *Of the heart, two notable little hollow caverns on each side of the heart.*
- Ventricles,** *Of the Brain, several notable caverns therein.*
- Vermiculations,** *Creeping like a Worm, or motions like the creeping of a Worm.*
- Vernal,** *Belonging to the Spring, or in the time of the Spring.*
- Verberation,** *A beating or striking.*
- Vertigo,** *A dizziness, giddiness and turning round within the head. A certain disease, which causeth a turning within the head.*
- Vertebral,** *Belonging to the joynts of the back-bone.*
- Vertebrae,** *Those several joyntings and knittings of the back-bone or chine, so called of Anatomists.*
- Vesicatories,** *Medicines that raise or cause Blisters where applied.*
- Veterans,** *Old Soldiers, or any thing that hath served long in a place.*
- Viaticum,** *Voyage provisions, as meat and drink upon a journey.*
- Vibration,** *A shaking, striking or quavering.*
- Vicinity,** *Neighbourhood, or nearness of dwelling or being.*
- Viscid,** *Clammy, or sticking like Bird-lime.*
- Viscosity,** *A Clamminess or glewiness.*
- Viscera,** *Are the chief Entrails or Inwards, as Heart, Liver, Lungs, Spleen, the Bowels, &c.*
- Vitriol,** *Copperas, a certain Mineral found in several Countreys used in Medicines.*
- Vitrolic,** *Belonging or appertaining to Vitriol.*
- Umbilic,** *Belonging to the Navel, or of the likeness or shape of the Navel.*
- Undulation,** *A wavering like the waters, where one follows upon the heels of the others.*
- Unctosity,** *An oilyness or juiciness.*
- Uctuous,** *Oylie or juicy.*
- Volatile,** *That easily flies away, or that is apt to flie or vanish.*
- Ureters,** *The pipes or passages, by which the Urine passes from the Reins to the Bladder.*
- Urinary,** *Belonging to the Urine, or the passages of the Urine.*
- Uterine,** *Belonging or appertaining to the Womb.*
- Uvea,** *The fourth thin membrane of the eye, called also Corion.*

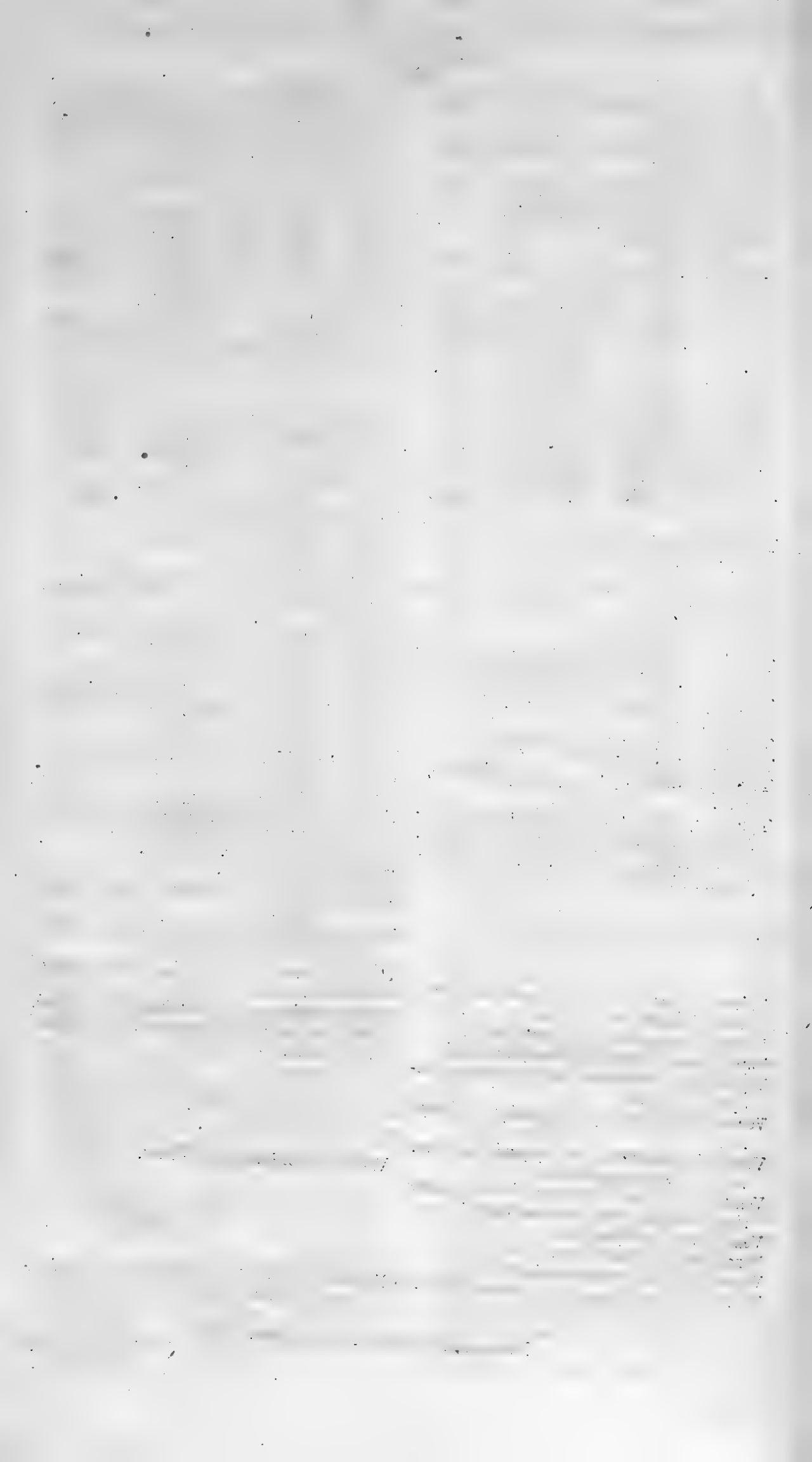
W.

- Wezand,** *The Windpipe or Throat.*

X.

- Xeroeus, Wine:** *A Spanish Wine so called, I suppose they mean Tent.*

Here ends the Table of hard names.



ON THE AUTHORS

Medical-Philosophical Discourses.

THE intricate and hidden Cause of things,
Both Peace and Strife by what means Nature brings,
What various motions Bodies do inspire ;
What mixes with the Waters quenchless Fire,
What Bonds the Elements together tie,
Before this happier Age unfolded lie :
Things hid to former Ages, and unknown,
The Secrets of the World to all are shewn.
Metals dug from the Bowels of the Earth,
Tho they from Phoebus boast their heavenly birth,
We without Light dark and obscure behold,
And Splendor's found only in burnisht Gold.
Iron unknown lay hidden without light,
By Slaves wrought from the Mine grows dazeling bright.
This to whole Troops confusion doth afford,
Wit, which first fram'd , stoops to the Victors Sword.
We thus of old did Nature search in vain,
Our Arts did only ith' outward Bark remain,
But now we her hid Mysteries unfold,
And the great Secrets of the World behold.
Better than us, her self can hardly tell,
What Love doth far within high Mountains dwell.
What flame first gives the Marble Quarry birth;
To Metals forms blind Rudiments of Earth,
And the hard child doth to perfection bring :
Why Earth shews her rich Treasures in the Spring ;
And shines, made brave with her own Native Flowers :
What gentle Gales, and what sweet moistning Showers,
Do on the pregnant Goddess Seed bestow ;
Whilst Heavenly Iris mounts the cloudy Bow.
Why Ceres swells with watery Nymphs embrace,
What Strife, what Wars spring from hot Bacchus Race :

What

The P R E F A C E.

*What Vulcan doth th' Ætnean Fornace blow ;
What doth soft fires through all Bodies throw ;
What Spirit nimbly moves the human frame :
Whence Milky Juice here, there a Purple Stream ,
Watering the Body : whence the crimson Flood ;
And the quick Circulation of the Blood.
What hidden fires in Veins and Intrals burn,
Which do the boiling Blood to Feavers turn.
What mixes freezing cold with parching heat,
And makes the different Zones together meet.
Whence comes the Pestilence with Stygian breath,
Riding on blasting Winds, and arm'd with death.
What prophesying Humor through the Reins doth pass,
What colour, and what odour in the Glass ?
All things lie open now ; He did not know
So much to whom Prometheus did bestow
His stolen Fires : We now every part
Of the whole Earth compass about with Art.
He's happy who causes of things can shew ;
Sacred to Nature, and to Phœbus too ;
About his Temples Delphic Laurels spread,
And Flames of Lightning ne'r shall blast his Head.
Whom Hermes doth with Sacred Arts imbue,
Whose Labours, Learning out of Darkness drew,
May all's days happy be, may he shine bright,
And may he still enjoy Celestial Light :
May no Disease infect with poysonous breath,
Him, who gains Health from Sickness, Life from Death.*

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A
Medical-Philosophical Discourse
OF
FERMENTATION.
OR, OF THE
Intestine Motion
OF
PARTICLES
IN EVERY
BODY.

BY

Dr. THOMAS WILLIS of Christ-Church in
Oxford, and Sidley Professor of Natural Philosophy in that
Famous Univerſity.

Translated into *English*, by S. P.

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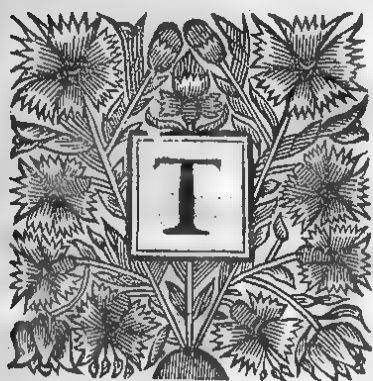
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T O T H E
Most Reverend Father in Christ,
And the Right Honourable
HIS GRACE,
GILBERT,
By Divine Providence,

Arch-Bishop of CANTERBURY,
Primate and Metropolitan of all *England*, and one of His
Majesties most Honourable Privy-Councillors.

Most Holy Prelate,



THE Eagle will not acknowledge his suspected Chicken, by one only sign; for it is not enough that it can look against the Light, unless it be able also to behold the Sun's Beams without Winking: and indeed although this our hasty Issue, whether by the help of its own blindness, or of that doubtful Light in which it liv'd, hath been able to come abroad, yet it hath not sufficiently given Marks of its true Race, until it might delight its Eye with your Brightness, as at the Sun's Beams.

These Meditations or Discourses, though several times published, now therefore at length boast, that they are able to shew themselves to the Light first, with your Sacred Name in the Front, it is then but reason, that the same *Mecenas*, who hath brought me forth into the open light, from my own darkness, and

A

from

The Epistle Dedicatory.

from the Filthiness and Soot in which I was involved, being condemned among the Metals; should think not it any detraction, to lend to my Works Ornament and Splendor, as well as to the Author and Publisher.

It was by your means (most Noble Prelate) that I obtained the Votes in this Famous University for the Place of *Sidly Professor*; for how small soever my Merits might seem, they were helped by the Greatness and Weight of your Opinion.

I am exceeding conscious to myself, how unfit, being destitute of all help, I came to that Province, both for the Dignity of the Place, of the University, and of my *Mecenas*, yet I believe nothing is to be despair'd of, under so great Auspices. I would therefore, if there be any thing, at any time, more happily thought of, in the Scrutiny of Nature; and brought forth by me, that it be not referred to my Ingenuity, or (which I might perhaps more truly deserve) my Industry, but to the Influences of my Patron: For to him only he Dedicates and Consecrates himself and all his, who is

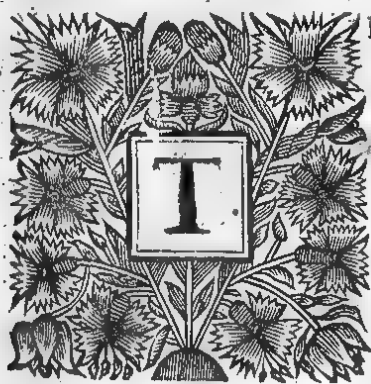
Your Graces most Humble

And for ever Obliged Servant,

T. W.

OF
 FERMENTATION;
 OR THE
 Inorganical Motion
 OF
 NATURAL BODIES.

CHAP. I.

Of the Principles of Natural things.

Here is nothing more rarely to be met with in the Vulgar Philosophy, where Natural things are unfolded, with the vain figments of Forms and Qualities, than the word *Fermentation*: but among the more sound (especially of later years) who respect the Matter and Motion chiefly in Bodies, nothing is almost more usual. But Fermentation hath its name from Fervescency, as Ferment from Ferviment or growing hot. The word is well known in making of Bread, and in the purging of new Wine, Beer, and other potable Liquors: thence it is also applyed to other things, which are wont to swell or grow turgid, after the same manner: that at length it signifies, whatsoever Effervency or Turgency, that is raised up in a Natural Body, by particles of that Body variously agitated.

Bodies of a diverse Consistency and Habitude, are apt to a Fermenting, viz. either Thin or Thick, Liquid or Solid, Animate or Inanimate, Natural or Artificial; in all which is found an Heterogeneity of parts or particles, to wit, there are in them some substances light, and alwaies endeavouring to fly away: and also there are others thick, earthy, and more fixed, which intangle the subtil Particles, and detain them in their Embraces, whilst they endeavour to fly away; from the strivings, and wrestlings of these two twins, in one Womb, the motion of Fermentation chiefly proceeds; but on the contrary, what things do not Ferment, for the most part consist of like Particles, and are of the same Figure and Conformation, which indeed consociate among themselves, without any Tumult or Turgescency, lye quiet, and enjoy a deep peace. If Must, or new Wine, or new Ale or Beer, be closely Bottl'd up, or put into Vessels of smal vent, they will grow so very hot, that often the Vessels are in danger of breasing. But if the same Liquors, being Distilled by themselves, and then what is seperated, shut up, from thence no motion or heat will follow. Wherefore, Distilled Waters, hot Spirits, Oyls, fixed Salts of Herbs, and very many other more simple preparations of Chymists, remain a long while without any Alteration or Fermentation, perhaps some of the Particles do evaporate, but the rest do not tumultuate. In the mean time the juice and blood of Vegetables or Animals, as also all Liquors Concreted, and compounded of many things, quickly Ferment, and from thence enter into divers turns of changes. The Spirit of Wine being closely shut up in a Phial shews no sign of growing hot, but if but a little Oyl of Turpentine be added to this Spirit, the Particles of the Liquors will so leap forth, that I have seen it break a Glass Hermetically

Sealed. All Distilled Waters of Herbs, so they be kept simply in a Glass, will remain incorrupt a long time, but if you add to the same Sugar or Syrup, it presently grows soure, and is corrupted: Wherefore, that the Fermentation of Bodies may be rightly unfolded, we must inquire what those Particles or Substances are, and of what Nature, of which mixt things are Compounded, and from whose being put together, and mutual strivings, motions for the most part naturally proceed.

Altho' there be many and divers Opinions of Philosophers concerning the beginning of Natural things, yet there are three chiefly deserve our Assent, and Faith, before the rest. That famous fourfold Chariot of the Peripateticks obtains the chief place, which emulous of the four wheel'd Coach of the Sun, is hurried by a quick passage, through the fictitious Heaven of the first Matter, and measures that vast and empty thing, with a perpetual reciprocation: For they say, all things are Constituted out of Water, Air, Fire, and Earth, and that out of the diverse transposition of these, Generation and Corruption, as also the changes of all alterations whatsoever, do arise. In the second place, and next, stands the Opinion of *Democritus* and *Epicurus*, which lately also hath been revived in our Age, this affirms all Natural effects to depend upon the Conflux of Atoms diversly figured, so that in all Bodies, there be Particles Round, Sharp, Foursquare, Cylindrical, Chequer'd or Streaked, or of some other Figure; and from the divers changes of these, the Subject is of this or that Figure, Work, or Efficacy. The third Opinion of the Origination of Natural Things, is introduced by Chymistry, which, when by an Analysis made by Fire, it resolves all Bodies into Particles of Spirit, Sulphur, Salt, Water, and Earth, affirms by the best right, that the same do consist of these. Because this Hypothesis determinates Bodies into sensible parts, and cuts open things as it were to the life, it pleases us before the rest.

As to the four Elements, and first Qualities from thence deduced, I must confess that this Opinion doth something help for the unfolding the Phenomena of Nature, but after so dark a manner, and without any peculiar respect to the more secret recesses of Nature, it saves the appearances of things, that 'tis almost the same thing, to say an house consists of Wood and Stone, as a Body of Four Elements. The other Opinion, which is only a peice of the *Epicurean* Philosophy, forasmuch as it undertakes Mechanically the unfolding of things, and accommodates Nature with Working Tools, as it were in the hand of an Artificer, and without running to Occult Qualities, Sympathy, and other refuges of ignorance, doth happily and very ingeniously disintangle some difficult Knots of the Sciences, and dark Riddles, certainly it deserves no light praise: but because it rather supposes, then demonstrates its Principles, and teaches of what Figure those Elements of Bodies may be, not what they have been, and also induces Notions extremely subtil, and remote from the sense, and which do not sufficiently Quadrate with the Phenomena of Nature, when we descend to particulars, it pleases me to give my sentence for the third Opinion beforementioned, which is of the Chymists, and chiefly to insist upon this in the following Tract, to wit, affirming all Bodies to consist of Spirit, Sulphur, Salt, Water, and Earth, and from the diverse motion, and proportion of these, in mixt things, the beginnings and endings of things, and chiefly the reasons, and varieties of Fermentation, are to be sought. If any one shall object, That the Atomical, and our Spagyric Principles are altogether subordinate, to wit, that these, tho at the last sensible, are resolved into those, only to be signified by Conception; I shall not much gainsay him, so it shews that those Conceptions are real. I being dull and purblind, leave the more accurate to quick sights, being content to be so wise as to perform the business of the outward Sense with Reason: for I profess, it pleases not me, to devise or dream Philosophy. But that our Work may more rightly proceed, it will be necessary, to speak first a few things of these kind of Principles in general, and of their Affections.

I mean by the name of Principles, not simple and wholly uncompoundd Entities, but such kind of Substances only, into which Physical things are resolved, as it were into parts, lastly sensible. By the intestine motion, and combination of these, Bodies are begot, and increase: by the mutual departure and dissolution of these one from another, they are altered, and perish. In the mean time, what Particles are gathered together in the Subjects, or depart away from them, will appear under the form of Spirit, Sulphur, Salt, or one of the rest.

CHAP. II.

A Description of the Principles of Chymists, and the Properties and Affections of them.

1. **S**pirits are Substances highly subtil, and Ætherial Particles of a more Divine Breathing, which our Parent Nature hath hid in this Sublunary World, as it were the Instruments of Life and Soul, of Motion and Sense, of every thing; whilst they of their own Nature are alwayes enlarged, and endeavouring to fly away, lest they should too soon leave their subjects, they are bound sometimes with more thick Particles, that by entring into them, and by subtilizing them, and variously unfolding them, they dispose the substance to maturity, as is to be observed in the Vegetation, and Fermentation of Bodies; sometimes being restrained within some spaces, to wit, the Vessels or Bowels of living Creatures, they are compelled more often to repeat the same measures of their motions for the performing the works of Life, Sense and Motion. From the motion of these proceed the animation of Bodies, the growth of Plants, and the ripening of Fruits, Liquors, and other Preparations; they determinate the Form and Figure of every thing, prefixed as it were by Divine designation: they conserve the bonds of the mixture by their presence; and open them by their departure, at their pleasure: they bridle the irregularities of Sulphur and Salt. The perfection and state of every thing consists in the plenty and exaltation of Spirits, and the fall and declination, in their want and defect.

As to the Subjects in which the Spirits are, Minerals because they are of a more fixed nature, wanting Motion and Vegetation, are almost without Spirits, or at least are contented with a few. For the birth and growth of Vegetables they are required in a more moderate quantity. In the Constitution of a living Creature, where there is greater Use of Spirits, for Sense and Motion, a far more plentiful quantity is found. In the works of Art, and chiefly in those which ascend to perfection, by Digestion and Fermentation, there are found to be a sufficiently great proportion of Spirits: but in all subjects whatsoever, whilst the immersed Spirits are mingled with the other Principles, their condition or state comes under a threefold consideration: for they are either depressed and scattered, and so involved with more thick Particles, that they are very little seen, or shew forth their powers, as in things undigested, crude and unripe, may be perceived, in which the Spirits can hardly extricate themselves into motion, and from which they can hardly be drawn by distillation. Or secondly, the Spirits flying forth from the thick substance of the rest, are full of vigor, shake and rightly dispose the more gross Particles, subtilize the thick, digest the crude, & bring things to the same or height of maturity & perfection: or lastly, Spirits having obtained the height of things, do luxuriate and make excursions out of the Body: hence those that remain, are by degrees lessened of their plenty and strength, until being less in power than the Particles of the Salts and Sulphur, they are put under their yoke, and by little and little are destroyed and driven away out of the Subject; on this threefold state depends the beginnings or rudiments, the maturity and exaltation, and the defect and end of things.

It is observed, when the Spirituous Latex is drawn forth of any Liquor by Distillation, that the vapor or steam is not elevated into dew, that is, comes together in little drops or dew, every where poured forth, as it is wont to do in watery things; but it is divided into streaks, and many little rivulets, and renders the Alembic mark'd in every part with straight lines, only not meridional, leading from the Centre of the top, to the brim of the Circumference. The cause of which seems to be this, to wit, since that the spirituous substance is very subtil, it is not easily Collected into Liquor, neither is it fixed every where about the sides of the Vessel, in its ascent, as watery Liquors, but alwayes stretches further, and unless when it comes to the top it self of the little head, doth in no wise stay; but there the spirituous breath, being restrained as it were in a punct, and being brought backward, it begins to gather into dew: wherefore, from that top, as it were the Fountain, the Spirits flowing forth on every side by streams, descend into streaks towards the mouth or brim of the Alembic. And when those lines wholly disappear, it is a sign that the spirituous substance is quite still'd forth, and that the watery breath only ascends.

2. Sulphur is a Principle of a little thicker consistence than Spirit, after that, the most active: for when the Spirits first break forth from the loosned substance of the mixture, presently the Sulphureous Particles endeavour to follow. The Temperament of every thing, as to Heat, Consistency, and amiable frame or contexture, depends chiefly on Sulphur; from hence also for the most part arise variety of Colours and Odors, the fairness and deformity of the Body, also the diversity of tastes. In the Bosom of this, the Spirits immediately, in which as in a Copula, they

are united, by the more hard embraces of the rest. The substance of Sulphur, tho less subtil, is yet of more fierceness and unruliness than the Spirits are, for this unless it be restrained, by the embraces of the others, as it were in bonds, and its Particles be detained one from another by the interjection or coming between of the rest, not only leaves the subject, but destroys its self, with too impetuous an eruption. Indeed the little bodies of this being gently moved, do cause digestion, and maturation, sweetness, and many perfective qualities in things: being a little more strongly moved, they induce heat, and excess of qualities, inordinations, and chiefly a stinking savour: but being more impetuously moved or stirred up, they bring in the dissolution of Bodies, yea a flame and Burning.

The substance of Sulphur is never seen sincere, yea it consists not of it self from others, but vanishes away into Air: its Particle being concreted and chained together with Salt and Earth, are fixed as it were immoveable, as is seen in Metals and some Stones: or being Diluted with Spirit and Water, and temper'd together with the rest, exist in motion, by which means (as was before said of Spirit) they are in a threefold state, within the substance of the mixture: for either first of all its little bodies being involved with Salt and Earth, or too much drenched with a watery humidity, are obscured, so that they exercise but little of virtue, from whence the humid and cold temper of things exists, their qualities are Obtuse, Dull, and of small virtue or force, and the Bodies less apt to be inflamed, as is discerned in unripe Fruit, raw juices and green Wood. Or secondly, The Particles of Sulphur begin to shine forth with Spirit, to be more thickly heaped or rolled together, and to appear eminent above the rest of the Principles. And so by its motion, they evaporate the superfluous moisture, digest Crudities, and induce a warm temper in things, active qualities, a lively force and maturation, or ripeness: which kind of exaltation of Sulphur may be observed in Wine and Liquors long Fermented; in ripe Fruits, in the Youth and florid Constitution of living Creatures. Or thirdly, The Sulphureous Particles being gathered into vigor, grow too hot, loose the bonds of mixture, and desire to fly away; and from their diverse manner of departure and separation, the dissolution of Bodies variously happens: For either they evaporate with Water and Spirit, by degrees, and without tumult, and leave their subjects lean and dry, which, when the Sulphur is wholly gone, fall into ashes: Or secondly, in Bodies which abound with Sulphur, when the mixture is loosened, and the Spirits begin to fly away, the remaining Particles of Sulphur are wont to be very much moved, and to grow exceeding hot; and being shut up in a thick substance, are gathered together more nearly, (as in Dung and Hay growing hot) and conceive heat, and sometimes Burning: breaking forth after this manner, by heaps, and impetuously, they breath out a stinking smell, and bring on a rottenness to the subject. There is a third manner of eruption, whereby the Sulphureous Particles go forth of Bodies, when they withdraw themselves, as it were with violence, and being gathered together, break forth into fire and flame: whereby indeed becoming unbridled and untamed, they break all bars or lets, and wholly destroy the substance or frame of the Subject: by this means, by their own and proper effervescency they procure a Burning, as when they being layed up wet, or the wheels of Carts or Axletree, made hot by motion, do fire, or because Sulphur is inkindled by Sulphur: for its Particles being impetuously moved, shake or move all that's near them, and carry them into the like motion of Conflagration, as shall be more fully shewn hereafter, when we shall discourse concerning the nature of fire.

Salt is of a little more fixed nature than either Spirit or Sulphur, nor so apt to fly away; but bestows a Compaction and Solidity on things, and also weight and duration; It retards the dissolution of Bodies, and promotes Congelations and Coagulations, and very much resists Putrefaction, Corruption, and Inflammation; to wit, forasmuch as it fixes the too volatile Sulphur and Spirit, and detains them in a Body: wherefore ponderous Woods, Stones, Metals, and what abound in Salt, are hardly enkindled, and remain a long while free from Corruption. Not only the duration of the individual, but also the propagation of the Species, depends very much upon the Principle of Salt, because the fertility of the Earth, the growth of Plants, and especially the frequent foetation, and bringing forth of young, in living Creatures, takes their Original from the Saltish Seed: hence it is, that *Venus* is said to arise from the Sea, and lust is called Salacity. For Salt having obtained a flux, gathers together, and stirs up into motion, the idle, or too much disjoyned little Bodies of Spirit or Sulphur, and excellently keeps them together with it self, for the producing the first ground-work of things.

Salt within the frame of the mixture, is either altogether fixed, when its Particles being almost destitute of Spirit and Water, but bound together with Earth, or Sulphur, or both of them, grow into Stones, Metals, or Minerals of another kind; which fixity in Nature is imitated in making Glass, and Earthen Ware: or Salt is loosened from its fixedness, to wit, when its Particles being mixed with the other Principles, and chiefly with Spirit and Sulphur, and Diluted with Water, do unfold themselves, and being diffused through the mixture, do Ferment with the rest: whilst the little Bodies of the Salt are after this manner put into motion, there is observed of them a threefold State or Condition, to wit, of Fusion, Volatilisation and Fluxation.

I call the State of Fusion, when the little Bodies of the Salt being Commixed with the rest, begin as to their smallest parts to be dissolved, and diffused, and explicated here and there, through the whole substance of the mixture, as may be observed in the Germination of Plants, in the first Conception of living Creatures, and in the beginnings of Fermentations; hence spring only a rude and indigested formation of things, an ingrateful savour, and for the most part bitter or biting.

From these first Rudiments of Motions, the Saline Particles ascend by little and little, to Vigor and Volatilisation, together with Spirit and Sulphur: to wit, whereby they run through the whole substance of the Body, and variously move its matter, and dispose it towards maturity. Some little Bodies sharpen, and stir up into motion, others Fix, Establish, and Congeal into a stony hardness. If there be plenty of Spirits and Sulphur, the Particles of Salt, as their handmaids, go about to unite, and associate themselves intimately with them, that they are not only snatched together with them, through all the recesses of the mixture, but (the subject being exposed to Distillation) Salt also ascends in the Alembic, even as the Spirit. From the Volatilisation of Salt, Beauty, and Fairness, and Savour chiefly sweet, happen in things, as in the florid blood of living Creatures, in ripe Fruits, as also in Sugar, Milk, and Honey, we know by experience.

I mean the Fluxation of Salt, when the saline Particles, which being first gathered together, with Earth, or Sulphur, or associated with Spirit, and so remain separated one from another, afterwards the bond of the mixtion being loosened, they become wholly free, and unloosened from the yolk of the rest: for so they flow together, explicate themselves through the whole frame of the subject, and whilst Spirit and Sulphur for the most part fly away, these exercise a dominion over the remainder, and induce a sourness into the whole mixture: by reason of this Fluxation of Salt, Wine, Milk, Blood, and Eatable Things, at first grateful and sweet, grow ingratefully sour when they begin to Corrupt; and for this Reason, all Salts whatsoever, having gotten a Flux, by a violent Distillation by Fire (that is, being driven from the Combination of Earth) grow sour, than if the same sour Liquor, be put upon the insipid dead Head, the Whole lastly becomes salted.

Salt being deprived of the Company of the rest, (except the Earth) becomes at last fixed, as is observed in Sea-Salt, or the incineration made of Herbs, whose Particles so cleave together, that they cannot be pulled asunder by the strongest Fire. When Vegetables are Distilled, some Saline Particles, though but few, made fit for Fusion, ascend with the rest; and from thence some Distilled Waters retain a genuine savour of the mixture: The parts of living Creatures being exposed to Distillation, yield a Volatile Salt: when Minerals, or ponderous Woods full of Salt, are brought under by Chymistry, the Distilled Liquor is like to Salt that hath gotten a Flux, and is very sour.

Spirit and Sulphur easily unlock the substance of the mixture, and make way for themselves; but Salt cannot, unless it be snatched forth of doors together with the Spirit it self. As Spirit and Sulphur being outwardly applyed, in dissolving or burning a Body, open as it were the doors for their Companions shut within, so also, Salt Liquors Distilled, do the same thing: For Stygian Waters strongly Corrode Metals, and are seen like a flame put to them, to burn and consume the same.

Salt resists Inflammation, for that it detains the Sulphureous Particles in its Bosom, and hinders them from breaking forth. But excepting that Sal Nitre encreases the burning of Sulphur, which indeed happens by accident, because that Salt, as it were an Hermaphrodite, grows very turgid with Sulphureous Particles also, combined in the mixture; wherefore, when the Salt is melted by other fired Sulphur, the shut up Sulphur, breaks forth with violence, and (like a blast from a Bellows) shakes the inkindled fire round about, and drives more impetuously the subject into a Body: In the mean time, if you put the flame to Nitre, it will not be inkindled at all; but being put to a Sulphureous Body, it promotes its enkindling; but the other Salts, less turgid with Sulphureous Particles, or rather destitute of them, being mixt with Sulphur, hinder its inkindling, and sometimes put it out.

So much for the active Principles, which effect, as it were, the first ground-work of Bodies: those which follow, chiefly bestow on them Consistency and Substance. For from hence exist either Liquids or Solids, Small things or Great. For Water and Earth fill the little spaces that are empty, through the Combination of the rest, with their coming between, and amplify and enlarge the lineaments of the Body, otherwise too short and contracted.

4. Water is the chiefest Vehicle of Spirit and Sulphur, by whose intervention, they consociate one with another, and with Salt; for the other Principles, being dissolved by a watery humour, or at least diluted, continue in motion, without which they grow stiff, as congealed things.

When Water is wanting, the active Principles meet together too strictly, and mutually rub against, and consume themselves; and when for this reason, the suppliment of food is cut off, the Body grows withered. If humidity abounds too much, these Elements are estranged or dissociated too much one from the other, wherefore the subject becomes sluggish and slow, and of less

less efficacy, and unapt for motion. Besides, Bodies too moist, are lyable very much to rottenness and Corruption; because from too much Humidity the Combination of Spirit, and Sulphur, and Salt, is too loosly effected; that they do not mutually embrace one another, nor are retained with their embracement, in the subject. Indeed Water abounding, easily evaporates, and then the frame of the mixture being loosened, and the doors set open, Spirit and Sulphur easily break forth, the way being made, and leave the subject, as it were vapid, or made sharp with Salt: For from hence, the infusions of Vegetables, Decoctions, Juices of Herbs, and all Liquid preparations, if the quantity of Water be greater then the rest of the Principles, and impropportionate, quickly Corrupt.

Water is most easily drawn forth out of every thing by Distillation, for when Spirit and Sulphur are often intangled with nets of Salt or Earth, they hardly let go their embraces, and are not obedient but to a more intense heat, and oftentimes require a previous Putrefaction. Water most easily, and often with no labour, is driven out of every Body; but most often it snatches in its flying away, some more loose Particles of Spirit and Sulphur, and carries them with it self, forth of doors.

5. As the interjection of Water in Liquids, so of Earth in Solids, fills the empty little Spaces and Vacuities, left by other Principles; for these hinder the active Principles from a too streight embrace, whereby they should rub against themselves, and cleave one to another; also by its thickness, it retains too Volatile things: besides, it enlarges the due substance, and magnitude in Bodies.

The more that Earth abounds in any thing, it is so much the less active, but of longer duration: Hence Minerals endure a long while, then next the greater Trees; in the mean time Animals, and the more slender Plants, are but of short age.

In Distillations, Earth ascends the Alembic, almost not at all, or but in a very little quantity: for the most part it is left, with a portion of Salt, for a *Caput Mortuum*, or Dead Head; therefore it is called *Terra Damnata*, or damned Earth: because, when the other Principles are freed, the Prison being as it were broken, this is still detained: besides Earth being deprived of the Company of the rest, is of no Use, nor capable of change, or exaltation.

Thus much for the Elements or Principles of Natural things, considered apart, and by themselves. It follows, that some of their Affinities and Conjugations be unfolded: because these very strictly cohere with those, and very hardly or not at all are joyned with others. Out of the mutual Combination of some, and disagreement of others, various Affections arise, the knowledge of which gives no little Light to the Doctrine of Fermentation.

There is a certain Kindred and Similitude of parts, between Spirit and Sulphur, which are agil or light, and easily to be dissipated in both; wherefore, Spirit being driven forth of the Body, draws abundantly with it Sulpureous Particles, as is discerned in Spirituous Liquors Distilled out of any thing; to some of which if you mingle Water, the Liquor appears as it were troubled with precipitated Sulphur; but the Spirit without the Sulphur is undiscernably mixed with the Water, which however by reason of its Volatility, may be also easily drawn away and separated by Distillation.

Altho Spirit and Sulphur are Principles very resembling, and (because of of a ready motion) either are inflameable, yet they are not one and the same, as is asserted by some: For Sulphur Copiously subsists in Bodies almost destitute of Spirit, to wit, in common Sulphur, Antimony, and other Minerals; in which its Particles are very fixed, and of their own nature, almost immoveable, which is very far from the Nature of Spirits: For they abounding in any mixture, never lye idle, and alwayes in motion, bring various alterations to the Subject where they dwell; then if they abound in strength, they easily and without tumult carry themselves forth of doors of their own accord. But Sulphur, altho it abound, doth not easily evaporate, but hath need of a strong heat, or an actual fire, that may make a way for it; and lastly, it breaks forth not without a stink or burning: yea, if you endeavour to Distill Oyl and Fat things, although very Sulphureous, with a moderate Fire, they are wont to yield a Liquor only Waterish, and not inflameable; but if we Provoke generous Wine, which swells with Spirit, by the gentle heat of a Bath, a most burning Water will Still forth, and apt wholly to be inflamed.

Spirit is not presently joyned with Salt: For Sugar and Salts are scarcely dissolved by the rectified Spirit of Wine, but are after a manner associated by a long digestion and circulation; as is perceived in the Volatile Salt of Animals, or Tincture drawn forth from the Salts of Herbs, or of Minerals, by the Spirit of Wine. If that Spirits excel in plenty, and virtue, they assume to themselves, and Volatilise the Saline Particles. And therefore the Salt contained in the Juice or blood of Animals, being associated with Spirit, is volatilised: Also the Spirit of Wine, being Distilled by many Cohalations, with the fixed Salt of Herbs, renders it Volatile, and makes it pass through the Alembic; but if the power of the Salt be greater, it tames the Spirit and fixes it. Hence the blood, being become Salt, by means of an ill dyet, becomes less Spirituous. Fixed Salts, and the Oyl of Vitriol fix the Spirits, grown too volatile and unbridled, and Coagulate the Spirit of Wine it self.

But Sulphur is a more fit Subject of the Spirit, by the coming between of which it easily is united with Salt and the other Principles; and as Spirit best agrees with Sulphur and Water, so Sulphur intimately cleaves to Earth and Salt.

As to Sulphur, besides its affinity with Spirit, it hath a great relation with Salt it self, to the volatilisation of which it doth not a little help: wherefore in Bodies which abound with a volatile Salt, there is found plenty of Sulphur, as in Amber, Soot, Horns and Bones, as also in the excrements of living Creatures; where Salt and Sulphur are in motion, and evaporate from the subject, a very stinking smell is sent forth; for Sulphur being sharped with Salt, pricks more strongly the sensory, and strikes it with its sharpness; in the mean time, Sulphur exhaling with Spirit, both pleases the sense, and excites a very pleasant smell.

Sulphur is as it were distracted between Spirit and Salt, and adheres at once to both parties. In the Distillation of Amber, Turpentine, Harts-Horn, and the like, a certain lesser part of Sulphur, being united to Spirit, first ascends and causes a Yellow Oyl, or clear Liquor of a grateful smell: the other part of Sulphur, being joyned to the Salt, is driven forth in the second place, and is Distilled with a most stinking smell, in the form of a red or black Oyl: In like manner, in the Circulation of the Blood, a pure and delicate portion of Sulphur, being mixed with the Spirit, supplies both the Animal and Vital Spirit with matter; the other more thick part, being Boyled and Rosted with Salt, is laid up in the Chole-dock Vessels (or belonging to Choler) as it were a certain excrement separated from the Blood. As Spirit does not easily Cohere with Salt, so Sulphur does not with Water: wherefore Fat and Oily things, as also Gums and Sulphureous Resines, either swim upon the Water, or sink down to its bottom. But Sulpureous things, Salt coming between, are commixed with a Watery Liquor, as we see Oyls imbued with Sugar or Salt, to be dissolved in common Water, which otherwise would flow separate.

Sulphur is not so tractable in Distillation, as Spirit, Water or Salt: for the Particles of this, being very Viscous, stick together among themselves, and also to others, that they cannot easily be pulled from their embrace. Hence among Sulpureous things, there are some, which are not forced, but by a strong and burning heat, into a stinking Oyl, and very empyreumatick, or smelling of Fire: But others, more pertinaciously cleaving together, are not to be loosened by Distillation, but are only broken into integral parts; and so ascend under the form of a dry Breath, as common Sulphur, Benzoin, Camphor, and the like.

Salt, besides its affinity with Sulphur, is also most strictly united with Earth; wherefore, Stones, and the more hard Minerals, consist chiefly of Salt and Earth. The Acid Spirits of Minerals, (which are only Salts resolved into Liquor by Distillation) if at last they be poured on the *Caput Mortuum*, Cohere with a strict embrace to it, that there will be need of a most strong Fire, to drive them forth again. Also in Glass, the union of Salt and Earth is so strictly made, that it will not suffer a Divorce by any means. Salt also is most easily Dissolved in Water; and it melts of its own accord, in a moist Air: and these are as easily separated one from another.

By reason of these Combinations, these Principles have got various Appellations and not Congruous in their own Nature to themselves: For Sulphur, forasmuch as it is Associated with Spirit, is called pure and sweet; when with Salt, impure and stinking, for as much as with Salt and Earth, it is called thick and Earthly; when the Spirit assumes to it self Sulphureous Particles in a moderate quantity, it is seen to be sweet; when saline, sharp; when both, bitter. Salt has a diverse disposition, and is known by many names, by reason of its various mixture with the other Elements, and chiefly with Earth; for besides the Titles of Fluid, Fixed, Volatile, for this reason it is termed Marine, Aluminous, Nitrous, Vitriolick, Armoniack, or of some other kind. By some, these kind of Conjugations are esteemed, but wrongfully, as so many divers Principles, when they are but simple mixtures, by the coming together of the first Element, and being loosened by Distillation they openly shew their Race, from whence they are. For all salts whatsoever being driven into a Flux by the Fire, shew Liquors very near of Kin one to another, to wit, Acetous: by the like means Spirit and Sulphur are compelled to put off their masks, and to resume the Native Species common to each.

And so much for the Principles of Natural Things, and of their Affections and Conjunctions. It is abundantly manifest, that these kind of Substances are in every Body, (besides the Analyses of Bodies Chymically instituted) also from the Mutations, and effects of Things, which happen of their own Nature. When Must is ripened into Wine, is not Spirit, a Sulphureous part, also Salt, and Earth Conspicuous to our Taste and Eyes, besides the Water, Liquor? Also the Juice of every Plant being exalted by Digestion, exhibits the same sincere, and is as it were distinct: what is greater, things subject to the Flame, when they seem to be burnt, and reduced almost to nothing, they go into these kind of Particles; besides the salt remaining in the Ashes, the smoke and Flame grow together into soot as it were a Meteor, in which are comprehended together, Spirit, Sulphur, Salt, Water, and Earth, as it were in a certain compendium of the mixture. For the active Principles abound in Soot, more than in any other inanimate Body.

But

But because with some there hath spread a certain suspicion, that those our Principles, chiefly the Saline and Sulphureous, are to be produced for the most part by Fire, and are no ways to be found in mixt things, unless after the coming between of that: I will witness to you in some instances, that the thing is plainly otherwise. Concerning the first, It is commonly known, that the Ashes of every Plant, being once Elixivated; or made into a Lye, if it be afterwards Calcined, will not yield any thing of Salt; besides if Concretes being Distilled, Exhale or Breath forth a very sharp or acid Liquor, their Calx is not saltish; and on the contrary when the Salt being Volatilised or brought to a Flux, ascends the Alembic, you shall seek for it in vain in the dead head. To prove the existency of the sulphureous Principle in Vegetables, take Guaiacum, or a peice of any other ponderous Wood, & being put into a Glass Retort, draw it forth by degrees; it shall exhibit, together with an Acid Liquor (which Water is saltish) in great quantity, a blackish Oyl (which part of it is sulphureous.) It appears from hence that this was in the Body before the Distilling, and in no wise produced by its Operation, because if you proceed after another Manner, that the Sulphur may be taken out of the Concrete before Distillation, the Liquor that comes forth will be almost wholly deprived of its Oyliness: Wherefore, if you pour Spirit of Wine to those Chips of Wood, it will Extract in great quantity, by this Menstruum, a pure Refine, which is the sulphureous part it self; then if you Distill (as before) in a Retort, the remaining Chips being washed in common Water, and dried; you will have a very little Oyl only. What is more to be admired, and confirms also more fully the truth of this kind of Origination, some Bodies, which being almost destitute of Spirit and Sulphur (because chiefly Volatile) consist chiefly of Salt, Earth and Water, are separated into the Elements by Distillation: the same mixture in number, and wholly known by the same accidents, is restored to them, being mingled together again; for example, if you distill Vitriol in a Reverberating Furnace, you will have a Phlegm almost insipid, or a Watery part, then a Liquor very soure, or a Salt having gotten a Flux, and in the bottom, a Red Earth, and finely Purpled: this being rightly performed, if the two Distilled Liquors be poured to the dead head, you shall have the same Vitriol as you had before, and again revived, in the same Colour, Taste, yea and almost in weight. In like manner you may proceed, with the same success, with Nitre, Sea-Salt, Salt of Tartar, and perhaps with Alum and other Minerals; so that those Concretes, which consist of fixed and stable Elements, may like a Mechanick Engine be pulled into peices, and presently without hurting the Machine, be restored or made whole. But there is enough spoken concerning the Principles of Natural Bodies. These being thus premised, we will proceed to the thing proposed in the beginning, to wit, the Doctrine of Fermentation.

CHAP. III.

What Fermentation is: Its Division as to the Subjects; and first of Minerals.

Fermentation is an intestine motion of Particles, or the Principles of every Body, either tending to the Perfection of the same Body, or because of its change into another. For the Elementary Particles being stirred up into motion, either of their own accord or Nature, or occasionally, do wonderfully move themselves, and are moved; do lay hold of, and obvolve one another: the subtil and more active, unfold themselves on every side, and endeavour to fly away; which notwithstanding being intangled, by others more thick, are detained in their flying away. Again, the more thick themselves, are very much brought under by the endeavour and Expansion of the more Subtil, and are attenuated, until each of them being brought to their height and exaltations, they either frame the due perfection in the subject, or compleat the Alterations and Mutations designed by Nature.

Fermentation is an action or motion meerly Natural, and what doth perform it, are only Particles Naturally implanted in the Concrete; yet as to the subjects in which they are found, it is wont to be variously distinguished. And either things of Nature are said to Ferment in a threefold Family, of Minerals, Vegetables and Animals; or the Works of Art, to wit, when Actives are applied to Passives by an outward Agent. Though the Term and Consideration of Fermentation, are chiefly due to Artificial things, and things made by Hand; yet it will not be from the purpose, to speak first something of Natural Things; that a Comparison being made of either, the Truth of our Hypothesis, and the certainty of the Principles may be confirmed. But this only lightly by the way, in this place I shall pass over, because their more full handling belongs to Physiology, or the Discourse of Natural or Physical Things.

In the first place, as to Minerals, altho in the bowels of the Earth, the Fermentation is less conspicuous than in the Superficies, yet it easily appears that the Elementary Particles, or the Fermentative Principles, are included in the depth of the Earth, as in a certain pregnant Womb: which there constitute Concretes, and things gathered together, by strict Embraces, the Productions of Minerals; but being loosned, and moved in the Bosom of the Earth, or exhaled upwards, cause the appearances of Meteors.

First, The Generation of the more hard Minerals, induces rather Congelation than Fermentation; because indeed these Principles, growing together in every Subject, are so fixed, and as it were bound together in Bonds, that they are not able any wayes to move themselves, or to depart one from another: This kind of fixation chiefly depends on the plenty and greater proportion of Salt and Earth (sometimes with an addition of sulphur) than there is of spirit or water, to wit, salt and earth, being most smally broken, and resolved even into a Vapour, lay hold of one another, and stiffen into a hard matter, and at last not to be loosned; almost after the same manner as making of Glass, and the burning of Bricks and Earthen Ware, are performed. For Glass consists of Salt and Earth, which when broken into most small bits, by a very intense Fire, they suffer a flux, they mutually lay hold of one another, and so strictly and intimately come together, that they are never to be parted. Glass is more fragil, or easy to be broken, then Earthen Pots, or Minerals, because it has a greater plenty of Salt, than of Earth, which is more plentiful in Earthen Ware, and in Minerals: To some of which, also happens a modicum of Sulphur, and for that reason they are more tenacious and ductil, as is to be observed in Metals, when in the mean time stones, and what contain little of Sulphur, are fragil, and apt by every stroke to fly to peices. In Vitrification there is need of a violent Fire, for the fusion of the Salt and the Earth (whose Particles, as is commonly said, are the Pestles of the Chymists,) but within the Bowels of the Earth, there is not required such a fusion of Fire for the Concretion of Minerals, because Salt and Sulphur exist, being naturally resolved into most simple Particles; which, when they lay hold on the Earth, easily stiffen into Metal, or into a stony hardness. There are some Fountains found out, which, for that they flow with a primitive Salt, and resolved into small Particles, whatever Bodies are immerfed therein, they cause them presently to become stony. We have read also, of Men changed into Stones, yea a whole City to have been stiffened into a stony substance, by the Air, or by some Vapour, brought forth of the Earth: The Faith of which thing is left to the Authors.

Meteors are made out of the same Principles by which Minerals are made, and conceived almost in the same Womb: but loosned from Concretion wandring here and there, and diversly fluctuating: or which being included in Subterraneous Vaults, and there moved, produce divers Springings up of Fountains, or ebullitions of hot Vapours; or exhaling from the Dens of the Earth, and being mixt with Airy little Bodies, they cause within the Region of the Atmo-Sphear, as it were a diverse fashioned Landskip, of Clouds, Winds, and the appearances of other things, in the Superficies of the Earth, or on high: in either there are highly active Principles chiefly Salt and Sulphur. Spirits are either deficient in Meteors, even as in Minerals, or are found only in a very small quantity or proportion: to wit, they are almost wholly excluded from these, by reason of the strict frame of the subject, which doth not easily yeild space and passage for their motion; also they abstain from those (*viz.* Meteors) by reason of the lax, and wholly loose structure of Matter, from whence they, who are mighty in swiftnes, easily break forth, and desire to fly away.

Within the Bosom of the Earth, the Saline Particles being loosned, even into a Vapour, and then kneaded with an Earthy Matter or the moistening of Waters, they cause Eruptions of Fountains, and Acidulous or Spaw Waters, which resemble the disposition of Vitriol, Alum, Nitre, sometimes of Iron or Copper. Also the Sulphureous little Bodies being loosned, and gathered together, enkindle an Heat, and sometimes Subterraneous Fires; by whose Breaths the Dens and Caverns being made Hot, like an Hot-House, whilst the Watery humours pass through them, they from thence conceive their Heat, and supply the Springs of Hot Fountains for Bathes.

In like manner, in this visible and Ethereal World, Vapors both sulphureous and saline, and of a diverse Kind and Nature, perpetually breath forth, and are diffused through the whole Region of Air. From hence the diversity of Winds, the vicissitudes of Cold and Heat, Rain, Snow, Hail, Dew, and hoar Frost, and what are of this Nature, have their Origine. Concerning the particular Instances of these, the famous *Gassendus* may be consulted; who, in his *Epicurean* Philosophy, most aptly deduces the Phænomena, almost of all Meteors, and the Reasons of them, from the Exhalations of Sulphur and Salts, either Nitrous, Vitriolick, Aluminous or Almoniac.

CHAP. IV.

Of Fermentation for as much as is observed in Vegetables.

IN Vegetables Fermentation is yet more plainly discerned; for whilst they Bud forth, Grow, Flower, bear Fruit, Ripen, Decline and Die, we may observe the divers motions of Particles or Principles, their various Habits and Tempers. I intend not here to describe the several ways and proceedings of these. It will be sufficient, for the unfolding the Doctrine of Fermentation, to take notice of some chief Instances concerning this Subject.

It is manifest by daily Experience, that all Plants whatsoever, exposed to a Spagyric or Chymical Operation, may with little labour, be resolved into the aforesaid five-fold Elements: But in some there is found a greater plenty of salt, in others of sulphur; in some spirits abound: Water and Earth are in most proportionated according to the Bulk and Magnitude of the thing. Plants, in which salt abounds, with a mean of sulphur, and a little quantity of spirits, are for the most part of long Age, somewhat big, or flourish all the Winter, or though their Leaves fall, they keep a Nutricious Juice under the Bark: Of which sort are the Oak, Ash, Elm, Box-Tree, and all ponderous Woods and Shrubs.

In some sulphur abounds, with a little salt and spirit, as are the Pine, the Firr-Tree, Cyprus-Tree, Juniper, Ivy, Olive, Cedar, and Myrtle-Trees, and all resinous Plants; which for the most part have a sweet smell, and are perpetually green, by reason the Juice wherewith they are nourished, is viscous, and not easily to be dissipated. In others, besides plenty of salt and sulphur, spirits also are found in a greater proportion; as are Fruit-bearing Trees, and especially the Vine, from whose Fruit, the Juice being wrung out, and purified by Fermentation, grows very big with spirit. Of this Rank are Plants for the most part Medicinal; also such as produce curious and odoriferous Flowers; but in some, Water and Earth luxuriate in too great a quantity above the other Elements, as in cold Plants, and such as grow in too rank a soil.

The Germination of Plants happens after this manner, either it is made out of the Seed, Root, Trunk, or of its own Nature, from the naked Matrix of the Earth. First, the spirit being shut up within, by the ambient Heat and Moisture loosening the frame of the mixture, being loosened, it presently endeavors to fly away; but being held back in its flight, by the more thick Particles of the rest, stretches forth more largely its Den, and together with the other Principles, with which it is bound, thrusts forth on every side into length and breadth; even as a little bundle of Silk, being contracted into wrinkles and folds, is opened here and there; in the mean time, the little spaces left by the enlargement of the spirit, and as it were made hollow, are filled up by the next Matter, driven even into the Vacuities. And after this manner the Architect Spirit, with its Ministers, salt and sulphur, still stretching forth it self, like a Snail, frames for it self an House, whose Inhabitant it is, and by dilating it self, stretches forth that, until at last it hath wrought the Plant into the due Bulk and Figure designed by Nature.

You may take notice, that the times of the year, for the Budding, Flowering, Ripening, and Decaying of Vegetables, are of great efficacy and virtue; all the Winter, the Womb of the Earth, as it were shut up, is almost barren; for the spirituous Particles, which are wont to actuate the rest, and as it were to lead the Dance of Natural Motions, are either chased away by the Winters Cold, or being congealed in their subjects, are fixed, wherefore at this time Germination and Vegetation are very rare, unless that some irregular Plants, which are composed of plenty of spirit, salt and sulphur, dare to break forth. But in the Spring, when the Bowels of the Earth begin to be a little warm by the Vicinity of the Sun, presently they are impregnated with a wonderful Fecundity, and produce the effects of their feminality. Not only the superficies of the Earth, but also the Water and Air, every where, grow big with spirituous particles, which, as it were, raise up from the dead the little Bodies of salt and sulphur, and bring them into Motion: Therefore, besides that the Plants Bud, the Juice and Blood of living Creatures is quicker, and more apt to abound. At this time the Birds and Fishes build their Nests, and bring forth Eggs; also we may perceive in our selves the Blood to flow high in the Vessels, and usually to Ferment too much. For all things are then full of this Ethereal substance, and the whole Bulk of Nature, as it were, inspired by a lively Fermentation, is abundantly fruitful of Motions and Generations. Yea, these our Principles, at first separated and dispersed one from another, led as it were by an Appetite of Copulation, enter into mutual Marriages, and being married together, almost by infinite Embraces, cause a most ample seeding and germination of the Herby State.

At the beginning of the Summer (and perhaps in some sooner, in some later) when sufficient time hath been granted for the stature and magnitude of every Plant, and that it is now come to the height of increase, it behoves Nature to perfect her Work, and to Cook and ripen the substance, as yet rude and undigested; wherefore the active Principles leisurely extricate themselves from the more thick, and creep forwards towards the top, there being placed with a mutual increase, they are formed into Flowers and Blossoms, from which at length (for that they are of a soft and light texture) spirit and sulphur easily evaporate, and the frame of the mixture quickly decays: But Nature careful of the perpetuating every thing, when it cannot keep for ever the Individuum, is so provident, that the species may not wholly perish: Wherefore she institutes new and more firm and lasting Combinations of spirit, salt and sulphur; for she selects from the whole substance of the Plant the more noble and highly active Particles; and these being gathered together with a little Earth and Water, she forms in the Seed, as it were the Quintessences of every Plant; in the mean time, the Trunk, Leaves, Stalks, and the other Members of the Plant, being almost quite deprived of the active Principles, are much depauperated, and are of less Efficacy and Virtue.

About Autumn, after the Seeds are framed (as it were pledges left in memory of the Plant) the particles of spirits, salt and sulphur which remain, being now placed in their strength or exaltation, endeavour a Dissolution and Departing one from another. And first of all, the spirits evaporate by degrees with the watery Humor, through the doors set open by the summer Sun, with which the more pure parts of the sulphur make also their Journey; in the mean time, the salt, being fixed with the Earth and more thick sulphur, is left behind; wherefore in most the Leaves fall at this time, and in those of a tender and light constitution, the Principles are wholly dissipated, and the Trunk and stalk, together with the Root, wholly die. In some, after the falling of the Seed with the Leaves, the stalks wither; in the mean time the Principles which may renew the Plant in the next Spring, are preserved in the Root.

Also Winter coming on, the face of things is wholly changed; and the Elements, which in the Spring did affect to be joyned, and to marry one with another, seek nothing more than Divorces. The Spirits fly away from very many things, and wander in the Air; in the mean time the particles of salt and sulphur lie as it were benumbed and asleep. Not only the Bodies of Vegetables, but of very many Animals, are left as it were dead all the Winter, till they are raised again to the Life by the Spirit, returning with the Vernal Sun, and as it were animated anew. But this little Branch being made concerning the Vegetation of Plants, it is now fit that we proceed on our Journey to Fermentation by the Rule of our before established Method, to what is to be observed concerning the Parts and Humors of Living Creatures.

CHAP. V.

Of things to be observed of Fermentation about Animals.

IT is so certain that the Bodies of Animals consist of the aforesaid Principles, that it wants no proof: For they so plentifully swell up with spirit, salt and sulphur, that their Particles are obvious to the sense; wherefore they are moved with a more swift motion, and more excellent senses of Life and functions of Heat in the subjects in which they are implanted, are enlarged. It would be too much labour, and tedious here to describe the several manners and processes of Fermentations. The first beginnings of Life proceed from the Spirit fermenting in the Heart, as it were in a certain little punct. The motion of this is not as in Vegetables, slow and insensible, and only to be known by their increasing; but presently becoming rapid, is conspicuous to the Eyes; because the Spirit leaping from the punct, as from a Prison, being stirred, and having obtained the Vehicle of Blood, swiftly runs forth; and leaping forth, it cannot wholly fly away, it makes hollow spaces for it self in the thick substance, in which it is included, for its excursion, being compelled some other way backward. Lastly, being returned to the Heart, it Ferments the more, wherefore it stretches forth further the spaces of its Excursion, and so easily makes an hollow way for its return back; and after this manner, for the carrying about the Blood, Arteries and Veins, as Channels and Rivulets are framed through all the parts of the Body: and on such a Vicissitude of Motion, or Reciprocation, depends the life of living Creatures, which that Nature might preserve a long while, she placed the Ferment in the Heart, by whose instinct, or endeavour, the Blood grows impetuously Hot, and as it were enkindled into a Flame by its Deflagration, diffuses the *effluvia* of its Heat round about on every side: for by the Fermentation, or Accension which the Blood suffers

in the Bosom of the Heart, very many Particles of Spirit, Salt and Sulphur, endeavour to break forth from its loofned frame: by which being much rarified, and like Water boyling over a fire, the moved and boyling Blood is carried through the Vessels, not without great Tumult and Turgescency. We would speak more in this place, both of the Natural Fermentation of the Blood, and the Feaverish, but that we reserve this Consideration for a peculiar Tract, where we Treat of Feavers.

Besides this Ferment constituted in the Chimny of the Heart, upon which the motion and heat of the Blood very much depends, there are others laid up every where in the Bowels, of a diverse disposition, by the help of which, both the Chyle (which is the Rudiment or Beginning of the Blood) and the Animal Spirits, its Quintessence, are truly framed. There are others also which serve for the perfecting the Blood, transmuting it into other Liquors, and freeing it from Excrementitious Matter: It will be too far from our proposed method, to wander, to insist upon each of these, and to reap anothers Harvest: Wherefore I will only add in this place, some select instances, which may illustrate the Doctrine of Fermentation.

It is commonly received, that the Concoction of the Chyle, in the Ventricle, is made by the means of a certain Acid Ferment: That such a thing is, the Acid Belching in a full Stomach, and the want of it in the loss of Stomach, in Feaverish and Dysenterical people do testifie, &c. and its restitution a sign of Health: to which may be added this Observation, Chalybeat Medicines being taken at the Mouth, a little after excite a Sulphureous savour in the Throat, as if hard roasted Eggs had been eaten: which seems wholly to be made by the Acid Ferment of the Ventricle, gnawing the Iron, even as Spirit of Vitriol, being sprinkled upon the filings of Steel, excites such a stinking and Sulphureous Odor. Some say this Ferment is breathed into the Stomach from the Spleen, but by what means that may be done, doth not yet appear by Anatomical Observation. It seems not improbable that this Ferment is implanted in the Ventricle, that it is only made by some remains of the perfected Chyle, which fixed in the folds of the Ventricle, and there growing sower, puts on the Nature of Ferment; even as a portion of Dough being fermented or leavened, and kept to a sowness, becomes a convenient Ferment or Leven, for the making of Bread. In like manner this kind of Acid humour being prepared from the Aliments, and long carried in the Ventricle, promotes the Concoction, and subaction or subduing of the Food; for Acid things, which are full of Salt, carried out to a Flux, excellently conduce both to the Fermenting and Dissolving of Bodies: Wherefore by the action of this, Salt and Sulphur, with which eatable things very much abound, are broken in the Ventricle, and are reduced into very small parts. The Chyle being after this manner Fermented, acquires a Milky colour, by reason that the Sulphureous Particles are dissolved together with the Saline, and mixed with the Acid Ferment. For if you pour an Acetous humour to any Liquor impregnated with Sulphur and volatile Salt, it presently grows white like Milk; as may be discerned in the preparing the Milk of Sulphur, or the Resinous extracts of Vegetables. Yea, the Spirits of Harts-Horn, or Soot, being very full of Volatile Salt, if they be poured to any Acid Liquor, or simple Water, acquire a Milky colour.

Concerning this Ferment hid in the folds of the Ventricle, it is observed, that it is after various manners, and changes the Aliments by diverse means: for tho in a sound Constitution it is indifferently Acid, and chiefly owes its force and energie to the Salt being brought to a Flux; yet it often declines from this laudable condition, and contains in it self either too much of sowness, or less than it ought to have: In the former Case, where the Salt hath got too sower a Dominion, all things taken in, (the Saline Particles being carried forth to a Flux, and the rest unduly brought under) presently grow sower; as most often happens in Hypochondriack Distempers: on the other side, where the Volatile Principles obtain the first place, (Fermentation being too hastily made) the Sulphureous parts of the Chyle are suddenly, and as it were forceably exalted; and the unconcocted of the Saline, pass into Choler: which ordinarily happens to those abounding with bitter Choler. They therefore who have the Ventricle affected after this latter manner, sweet and fat meats being eaten, they are troubled with a bitter and bilious Taste: Again, they who suffer the contrary disposition, altho they eat the most simple food, send forth plentifully Acid and stinking belchings: and indeed this seems to come to pass even after the same manner, as when a little too much Yest is put to the Batch of Dough, it becomes bitter; or when too great a Portion of sower Ferment, or Leven is put to the same Dough, the Bread from thence contracts a mighty sowness.

As the Blood in the Heart, and appending Vessels, the Chyle in the Ventricle, so the Animal Spirit is wrought in the Brain, whose Original and Motions are very much in the dark. Neither doth it plainly appear, as to the Animal Spirit, by what workman it is prepared, nor by what Channels it is carried, at a distance, quicker than the twinkling of an Eye. But it seems to me that the Brain with Scull over it, and the appending Nerves, represent the little Head or Glassie Alembic, with a Sponge laid upon it, as we use to do for the highly rectifying of the Spirit of Wine: for truly the Blood when Rarified by Heat, is carried from the Chimny of the Heart, to the Head, even as the Spirit of Wine boyling in the Cucurbit, and being re-

solved

solved into Vapour, is elevated into the Alembic ; where the Sponge covering all the opening of the Hole, only transmits or suffers to pass though the more penetrating and very subtil Spirits, and carries them to the snout of the Alembic : in the mean time, the more thick Particles are stayed, and hindred from passing. Not unlike this manner, the Blood being delated into the Head, its Spirituous, Volatile, and subtil Particles, being restrained within by the Skull, and its *Meninges*, as by an Alembic, are drunk up by the spongy substance of the Brain, and there being made more noble or excellent, are derived into the Nerves, as so many snouts hanging to it. In the mean time the more crass or thick Particles of the Blood, being hindred from entring, are carried back by Circulation : But the highly agil and subtil Spirits enter the smallest and scarcely at all open Pores of the Brain and Nerves, and run through them with a wonderful swiftnes : for there is need only of such Receptacles and Channels, for the Animal Spirit, in which there are none, or at least very small cavities or holes, otherwise the blood or excrementitious humours, their followers and companions would not be excluded. Also, besides, if these Spirits should run about through too open and loose spaces, being easily dissipated, they would fly away : wherefore, when there is need of a Pipe for the transmitting of blood, or serous water, the Spirit of Wine runs rapidly through the secret passages of the Instrument or Leather. Neither doth the more strict frame of the Brain and Nerves serve only for the straining of the subtil from the thick, and the pure from the impure ; but also that spirituous and most subtil Liquor, being as it were distilled from the blood, gets yet a farther Perfection in the Brain ; for there being inspired by a certain Ferment, whereby it is yet more volatilised, it is made more fit for the performing the offices of motion and sense. Because the substance of the Brain is exceeding full of a Volatile Salt, which is of great Virtue for the sharpening and subtilizing the Spirits ; therefore the Spirits of Harts-Horn, or of Soot, are far more penetrating than Spirits of Wine.

The Seminal Vessels and Genital Parts, do so swell up with Fermentative Particles, that there is nothing more : here Spirit, Salt, and Sulphur being together compacted, and highly exalted, seem in the Seed to be reduced as it were into a most noble Elixir. These kind of active Principles do not only Ferment in the Womb, for the forming of the Child or Young ones, but also as it were, with a living Ferment, they inspire through all the Body, the whole Mass of blood, that it may be more Volatile, and more sharply hot : Wherefore in Women who have the Ferment of the Womb in good order, their face is furnished with a curious and flourishing colour, their heat is more lively and copious ; moreover, the mass of blood growing too rank, there is need of emptying it every Month by the flux of their Courses ; but when this Fermentation from the Womb is wanting, both Virgins and Women become Pale, and and as it were without blood, short-winded, and unfit for any motion. Also in men, from the seminal Ferment, happen abundance of heat, great strength, a sounding Voice, and a manly eruption of beard and hair ; by reason of the defect of this, men grow womanish, to wit, a small Voice, weak Heat, and want of beard are caused.

Since we Treat of Ferments, which are found in the Animal Body, we may here opportunely inquire, what is the use of the Spleen : concerning which all good things are said by some, that it is as it were another Liver, and serves for the making of blood for the *Viscera* of the lower belly : it is by others reputed to be of a most vile use ; that it is the Sink or Jakes, into which the feculencies of the blood are cast. By reason of its structure, we make this sort of conjecture ; because the Arteries, do carry the blood to this, and the Veins bring it away, neither any other thing is carried in, or conveyed out ; and for that its substance is filled with black, and stagnating blood, it seems that it is as it were a store-house for the receiying of the earthy and muddy part of the blood ; which afterwards, being exalted into the Nature of a Ferment, is carried back to the blood for the heating of it : Wherefore, while the blood being carried by the Arteries, enters the Spleen, something is drawn from it, to wit, the muddy and Terrestrial Particles, which are as it were the dregs, and *Caput Mortuum* of the blood ; that by this means the whole Mass of Blood, might be freed from the Melancholick or Atrabilous Juice ; which is separated in the Spleen, even as yellow Bile or Choler, is in the Liver : wherefore, for the most part the Spleen is of a black or blewish colour, by reason of the feculencies or dregs there laid up. But as this Juice deposited in the Milt or Spleen, is not altogether unprofitable, but by reason of the plenty of fixed salt, is of a very Fermenting Nature ; it is not presently, as the Choler, cast into the sink, but is further Cooked in the Spleen, and being exalted goes into a Ferment ; which being lastly committed to the blood, promotes its motion and Volatilisation : Wherefore, as something is drawn from the blood, entring the Spleen by the Arteries, to wit, the Crude Juice of Melancholly ; so something is continually added to the same, flowing back through the Veins, to wit, the same Juice concocted and exalted into the Nature of a Ferment : Even as Chymists, in Distilling, that the Liquor may be made better, separate the subtile and spirituous parts, from the *Caput Mortuum*, and then pour them on it again ; and this work they so often repeat, till the *Caput Mortuum*, or dead Head, is by frequent Distillation Volatilized, and the Liquor rightly exalted, even in all its Particles. That this is the use of the Spleen, is a sign,

for that this inward being ill affected, the blood either ferments too much, as in the Scorbutick and Hypochondriack Distempers; or if the Spleen be Obstructed, or beset with a Scirrhus Tumor, the blood is destitute of fit Fermentation, and causes the Dropsie, Cachexie or evil disposition of the Body, or the Tympany.

As we assert, the Earth and muddy part of the blood, which consists chiefly of Earth and fixed Salt, being separated in the Spleen, to pass there into a Ferment; so it seems not improbable, that also the Adust, or as it were the fiery part of the blood, to wit, the Yellow Bile, which consists chiefly of Salt and Sulphur, being separated in the Liver, and from thence transmitted to the intestines, serves for some use of Fermentation. For this being mixed with the Chyme or Juice, fallen from the Ventricle to the Intestines, makes it there to grow hot and swell up; whereby both the Elementary Particles are more overcome, and by reason of the Rarification or swelling up, the purer part is wrung forth into the Milky Vessels, for the Nutritious Juice.

We are not only born and nourished by the means of Ferments; but we also Dye: Every Disease acts its Tragedies by the strength of some Ferment. For either the Sulphureous and Spirituous part of the blood, being too much carried forth, boyls up immoderately in the Vessels, like Wine growing hot, and from thence Feavers of a divers kind and nature are enkindled: or sometimes the Saline part of the blood, being too much carried forth, suffers a flux; and from thence it being made acid, austere, and sometimes sharp, is apt for various Coagulations; from which the Scurvy, Dropsie, Stone, Leprosie, and very many Chronical Diseases arise.

Yea we also endeavour the Cure of Diseases by the help of Fermentation: For to the preserving or recovering the Health of man, the business of a Physician and a Vintner is almost the same: the blood and humours even as Wine, ought to be kept in an equal temper and motion of Fermentation; wherefore when the blood grows too hot, even as Wine, it is usual to empty some out of the Vessels, and to allay its Fervor with temperate things. If any extraneous or heterogeneous thing is mixed with it, unless growing hot of its own accord, it drives it forth of doors; Purging, Vomiting, and Sweating Medicines by shaking and fusing the blood and humours, promote its seclusion: when that the blood is depauperated, and grows less hot than it should do, Cardiacks, Digestives, and especially Chalybeats or Steele Medicines restore its vigor and Fermentation: no otherwise than Wines growing sower, or degenerating into a deadness or want of strength, are mixed with more rich Lees, whereby they may Purge or grow turgid anew. I could easily unfold the Curatory intentions, as also the effects and operations of every Medicine, according to the Doctrine of Fermentation; but I design a particular Meditation for this thing: for the perfecting of which serious work, God willing, I have determined to add to the business of Medicine, as I hope, something not unprofitable.

Having thus far wandered in the spacious field of Nature, we have beheld all things full of Fermentation; not only in the distinct Provinces of Minerals, Vegetables and Animals, do we discern the motions and effects of this, but also the whole Sublunary World, seems as if one and the same substance were planted, and very pregnant through the whole with Fermentative Particles; which in every Region and Corner of it, as little Emmits in a Mole-hill, are busied in perpetual motion and agitation; they fly about here and there; sometimes upwards, sometimes downward they are hurried, they variously meet one another, associate themselves, and again depart asunder; with a continual Vicissitude they enter into divers Marriages, and suffer Divorces, on which the beginnings, the death, and transmutations of things depend. These little Bodies do not only very much abound in the bosom of the Earth, or in the midst of the waters, but they are especially diffused the whole Atmosphere of the Air in thick heaps. It is sufficient that I have noted in this place, some examples in a word: I have not determined a more full speculation of them here. It is time that we proceed from Physical things, to the works of Art.

CHAP. VI.

Of Fermentation, as it is performed in Artificial things.

IN the works of Art, so various and manifold provision of Fermentation is perceived, that it is altogether impossible to enumerate their several Species; or to reduce the divers instances of this to certain Classes or Heads of distribution. Making use of the third of the following method, we will subjoyn some examples, (which have happened to our observation) by whose rule, many others may be laid open.

Concerning Fermentation, which is made in the Subjects, made by hand, or humane industry, these three things are chiefly to be considered,

First, of what Nature and Composition Bodies are, that are most fit for Fermentation, and which are less convenient for it.

Secondly, What things are requisite about Fermentation, to wit, what are wont to promote, or also to hinder its motion in every Subject.

Thirdly, How manifold the motion of Fermentation is, and the end of it; also what are the effects and alterations which follow it.

As to the first, That all Bodies, (when tending to perfection) may truly Ferment, they are required,

In the first place, That there be some parts loose and disjoyned; otherwise the Fermentative Particles will not be stretched forth, or move from place to place: Wherefore in the more hard compact things, or in viscous things, or too much boyled, or evaporated to a spissitude or dryness, Fermentation does not succeed. What are Liquid, as Wine, Beer, the Juices of Fruits and Herbs, easily and quickly swell up; next to these what are soft, tho they are of a thicker Consistency, as Bread, and most Eatable things, and Medicinal Compositions.

Secondly, It is required that there be an Heterogeneity of parts, or a confusion of all the Principles together; to wit, that some Particles do oppose others, and stir them into motion. For the more simple Bodies, in which one, or at most two Elements only are strong, with a very small proportion of the rest, are unapt to Ferment: because like Particles, or Symbolical Elements, lye benumbed and quiet. But between the unlike, there arises presently a strife for domination, and some provoke others into motion.

Thirdly, There is a third condition, that there be neither too much Crudity, nor Maturity of parts, in the Body Fermenting. In the former, the active and subtil Particles are not easily extricated from the more thick, nor are brought into motion; as it appears in Juices, which are pressed forth from unripe fruit; also in Beer which is made of Barly or Mault, not come forth or germinated. In the latter the Particles being made too volatile, are not contained in the bond of the mixture, but presently evaporate, and dispose their Subjects to Putrefaction. Wherefore, Juice expressed from Summer fruits, or others too ripe, will not easily pass into Wine, but it will quickly Corrupt. And for this reason, extravasated blood, milk and urine, do not Ferment, but quickly putrifie.

As to the second thing proposed, there are many wayes by which Fermentation is either promoted or hindered. The first and chiefest, is the adding of a certain Ferment to the body Fermenting; the Particles of which, when being first placed in vigor and motion, may raise up the others, idle and sluggish, in the to-be-fermented Mass, and may drive them into motion. But there is a twofold Ferment; either absolute, which is the same kind of Body, in which the active Particles, being altogether placed in their vigor, are notable in motion, and so whilst they are committed to the Subject in Fermenting, snatch with them into motion other Particles of every kind, before sluggish: by this means Barm or Yest, beaten Eggs, and such like, stir up a Fermentation almost in every thing. Or the Ferment is respective, to wit, which consists of Particles, very much of one kind, which meeting other of another kind, in the Mass to be Fermented, grow hot with them, and so produce in the mixture a turgency or rising up of all the parts together. After this manner Saline Particles having gotten a Flux, grow very hot, with other Salines, either fixed or alchalisate; as appears when acetous Liquors are poured on Corrals, Harts-Horn, shells of Fishes; also when the Spirit of Vitriol, and the Salt of Tartar, are put together, a great ebullition is excited.

There are some accidents and external circumstances, which variously conduce, either to the provoking or hindring the motion of Fermentation; of which sort, are chiefly the condition of the Ambient Air, the placing or laying up of the Body Fermenting, and the means of conserving it.

The Southern Air (in which hot and humid Particles every where abound, which also easily entring any Bodies, obtain the force and place of a Ferment) impresses a notable motion of Fermentation in very many things: Wherefore in drinkable Liquors, it doth not only raise up at first, the force of effervescency or growing hot, but also for a long while after induces new swellings up in them being Fermented. On the contrary, the Cold and Northern Air, binds up, and very much fastens Bodies; and in very many things hinders the fusions, and flowings of the Elements, and oftentimes either hinders Fermentation from being stirred up, or restrains it being begun. Also the hot Summer Air, because it too much moves the active Principles, drives away the Spirits and subtil parts, exalts the Saline, and Sulphureous into a Flux, and so perverts their equal motion; and either the Sulphur or Salt being too much carried forth, it easily brings to Bodies a rancidness or putrefaction, or a mouldiness; which nothing favours the business of Fermentation.

It is a vulgar opinion, that some select times of the year, to wit, those in which the Vegetables of every Kind flower, cause anew the motion of Fermentation in the Juices, and other things,

things prepared of them, after they had fermented a long time before; so that Beer, when the Barly, and Wines, in the time that the Vine flowers, conceive risings up, or new Fermentations: They say also, that Bread and Flowr, when the Wheat is in Flower, is wont to become sooner musty and mouldy; also that spots or stains of the Juices of Fruits, as the Mulberry, Blackberry, Raspberry, and such like, being in Cloaths, are wont to be gotten forth again at that time when those Fruits are ripe. Concerning these things, I ingenuously confess, that I have not made trial of them, by my own proper observation, so as to dare to affirm it for truth in every part; I will therefore lightly pass them over, for it would both grieve and shame me (lest I should relate false things) to Philosophize concerning doubtful things.

Concerning the laying up of the fermenting Body, these things are chiefly to be observed. When things first begin to Ferment, that they are not to be shut up in too close Vessels, neither while the Liquors are hot, are they to be put into Bottles or Casks; for the Particles at first boiling up, and as it were rarified, desire a very large space; wherefore the Fermentation of Wine or Beer is begun in open large Vessels, but when they grow less hot, those kind of Liquors, lest the Particles being set and moved into motion too much, should fly away from the Subject, they are kept best either in a cold Cellar, or close Vessels. In the preparation of Vinegar, we observe the contrary; to wit, it is wont to be placed in a hot place near the Chimney or Oven, or exposed to the Suns-beams; to the end that the Vinous Spirit being depressed, the Saline part might be exalted into a Flux, and so might give a sharpness to the Liquor. There is another Observation, that Liquors do ferment better in wooden Vessels, than in Glass or Stone: for by long infusion, some Saline little Bodies are got forth of the Wood, especially the Oaken, which promote Fermentation.

As to the third thing proposed concerning this thing, although to speak properly, the motion of Fermentation is only a carrying forth of the Principles confused together, from a state of Crudity towards Maturity; and the end of it is a tendency to the Perfection of every thing; yet Use or Custom hath obtained, that this Word is attributed to very many other motions of Natural things, and includes other Ends and Effects, far different. Therefore when the Fermentative Particles in any Body, are greatly in motion, the Alterations which follow thereupon, may be in some respect referred to these three Classes.

First, It either respects the Exaltation and Perfection of the Parts of the same Body; or the Resolution and Corruption of them.

Secondly, Or the Dissolution of the Parts of another Body, is intended; or the Precipitation of those loosed.

Thirdly, By the motion and action of these kind of Principles, a Coagulation, and also a Congelation, now of the same Parts, now of different Bodies, are induced. It remains, that we briefly run through every one of these Species of Natural Motions, and Ways or Manners of Fermentation.

CHAP. VII.

Of Fermentation, as it is seen in the Exaltation of Bodies, and Tendency to Perfection.

THE Exaltation of the Parts, is perceived best in Works, or in all things appointed for Human Use, forasmuch as they get a greater Perfection and Vigor, by Fermentation; as chiefly Aliments and Medecines do; In many of these, we endeavour to carry forth the Spirituous Particles above the rest, and so to procure in the mixture, a grateful sweet taste, and other agreeable Qualities; as we may observe in Bread, Beer, Wine, Cider, and many others: But in some, we strive to exalt the Saline part, the Spirit being somewhat depressed; as in Vinegar, Meath, Broths; also in Sauce, Pickle, or in Preserved things, which are made of Salt and sharp Liquors. We rarely on purpose carry forth the Sulphureous part above the rest. for from thence a stinking smell, and ungrateful rammishness are wont to happen to eatable things. Among Food set apart for mans Use, Bread, Beer, Wine and Cider have the first place; which owe mostly, whatever they have of Virtue or Strength, to Fermentation.

Concerning the making of Bread, these things are chiefly to be observed: The Meal of Wheat or Early, or of any other Grain, being kneaded with common water, is reduced to a Mass, to be afterwards baked in an Oven. If there be nothing else added to this, it becomes forthwith heavy, and ponderous like Clay, clammy, and of an ingrateful taste, and of difficult digestion; but if in the kneading it, there be added a Ferment, the Mass presently grows hot, the Bulk swells, and afterwards being baked, it is made light, spongy, of good digestion, and grate-
ful

ful to the Taste. If you desire to know the reason of the difference, it is this; The meat of the Grain is imbued with a moderate proportion of Spirits, also of Salt and Sulphur; but the Particles of these are overwhelmed in the Mass with a viscous humidity, being kneaded with water; so that they move not themselves mutually, nor are in motion; wherefore in the baking, some superfluous humidity evaporates; what remains, is cleaving, viscous, and becomes pressed close like Clay, and ponderous. But when a Ferment is mingled with the Mealy Mass, the active Particles of the Ferment being first stirr'd up into motion, take hold of their Companions in the Mealy Mass, and carry them with them into motion. By this means, whilst some move others, they shortly are all stirred up into Fermentation; tumultuating here and there, they compass and run through the whole Paste or Dough, they subtilise and attenuate the clammy and terrene parts, and they lift up the mass, with the motion, and make it hollow, with little holes; which yet in the mean time, lest it become too spongy, and whereby the parts made hollow, and attenuated, might more exactly be mixed, it is wrought with long kneading, then afterwards, before the Fermentation ceases, and before the hollowed parts sink close down, it is baked in the Oven. In the baking, the superfluous moisture evaporates, and moreover, very many Particles of Spirit, Salt, and Sulphur, fly away; wherefore, the mass becomes lighter, and less ponderous, in the mean time, those which remain in the Bread, being much exalted, and brought to maturity, cause in it a laudable consistency, with a grateful smell, and taste.

The Ferment commonly used, is a portion of the Mealy Mass, and unbaked, which is kept, being imbued with Salt, to a sourness (it is called in *French*, *Levain*, because it lifts up the Mass) or the flowing of Beer, or Ale, called Yest or Barm; or for want of these the lees or dregs of Beer, or beaten Eggs, are made use of. In the mealy Ferment, the Saline Particles having gotten a flux, do chiefly predominate; as also in the faces of Beer: wherefore the Bread Fermented by these, is made harsh and somewhat sour; In the mean time, Yest being very big with Spirit, Ferments the Bread more potently, and brings to the Mass lightness, and a very grateful sweetness. Beaten Eggs abound with Spirit and a Volatile Salt, and do yet more cause the Bread to Ferment, and render it more Spongy: without doubt there may be other kinds of Ferments used; for whatever are big and turgid with Spirit, or abound with Salt carried out to a Flux, seem to be fit enough for this use.

Sometimes the mealy Mass is kneaded with Sulphureous matter, as Butter, Sewet, Fat, or such like, which being baked in an Oven, while it is hot, it is seen to be light and spongy, (to wit, while the Sulphureous Particles are kept in motion by the heat contracted in the Oven) afterwards, when this Mass grows cold, it becomes heavy, weighty, and very close: to wit, the ascitic heat being exhaled, the Sulphureous Particles, before carried forth, at length sink down; and when the Particles of the rest, not being excited into motion, the Mass therefore becomes as it were Infermentated: For in these kind of Subjects the Sulphureous Particles, because they are very viscous, hinder the motion of the rest, nor can they themselves persist in motion, longer than they are forced, by the actual heat.

Bread is sometimes made of the flower of Wheat, or Barly, that is Germinated or Maulted, which without any Ferment added to it, becomes so exceeding hot, that it cannot be contained in a compacted mass, but that in the baking it spreads abroad: the reason of which is, in such Flower, by the Maulting it, the active Principles are before placed in their vigour, and exaltation; wherefore in the kneaded Mass, when they are urged, by the heat of the Oven, they run forth inordinately, and force the more thick parts, hindring them, and as it were sling them down head-long. We have said enough of making Bread; we will now pass to Beer.

Beer is made of Mault or Barly, germinated and dried, which is performed after this manner: First, the Barly is put into common water for three days, that it may intumesc or swell, then (the water being let out from it) it is flung in a heap upon a dry floor, moving it twice or thrice a day, lest it grow too hot, until it begins to germinate, or bud forth, or put out little shoots of Roots. Afterwards, by frequent casting it about, it is hindered from germinating or springing forth any farther, and lastly, being lay'd upon a Kiln, it is made dry by roasting it; by this means, it yields a meat wonderfully sweet.

The reason of this kind of process is this; the Barly is permitted to spring forth, that its active Principles might be brought or set into their strength, or exaltation: for when it germinates, the Spirit, Salt, and Sulphur, at first asleep, and sluggish, do swell up or grow big together, and their sluggishness being cast off, they are prepared to exercise their powers. The other preparations, hinder the Barly from germinating further, lest that its Principles being very much loosned, should exhale too much, and fly away from the Subject. The Meal of the Barly thus prepared grows sweet, because the active Principles are set in exaltation like Fruit brought to a maturity: wherefore also the Liquor impregnated with this Mealy, grows very turgid or big with Spirituous and Fermentative Particles; when the simple decoction of Barly, scarce Ferments at all, nor is kept long, but that it becomes musty, and insipid.

But Beer is made after this manner; upon the Meal of the Barly, prepared as above said, boiled water is poured, and is suffered to be macerated, or mashed, for some hours, that it may be

sufficiently impregnated with the active Particles of the germinating Barly, now placed in their vigour: This Liquor being satisfied or filled, is drawn off clear from its settling, and is lastly boyled, that it might get a something more thick consistency, and be able to be kept the longer: Then, when it is somewhat cold, it is fermented, a ferment, or the fowring of Beer or Yelt, being put thereto, and so tunnd up in a Barrel. Concerning its Fermentation, these things are especially worthy of observation.

If it macerate with, or stand too long on, the Maulted Meal, the Liquor becomes thick and clammy; and afterwards will hardly ferment or work at all: the reason of this is, because the active Principles, in this work, are of a prompt motio; and move together with them, the earthy Particles; with which, if by a long stay, the passages and pores of the Liquor are filled; being too full, they are wholly obstructed, and as the contents in the Stomach, stuffed to a surfeit, scarcely ferment at all.

If too hot, or too cold, the Liquor be put into the Barrel; as in the great heat of the Summer, or the cold in the Winter, Fermentation doth not rightly succeed: for by too much heat, the Particles are dissipated one from another, that they cannot, mutually take hold of one another, and so work; by too much cold, they are bound up and fixed, that they scarce enter into motion, neither perform it strongly.

When the Liquor of the Beer ferments in the Vat, the active Principles do on every side explicate themselves, they precipitate in the bottom the more thick, and Earthy, being partly driven as it were into flight, and partly sticking to them, they lead them as it were Captive to the top, and there make hollow bubbles continually growing up, and bring them as it were to servitude. After a due Fermentation, the whole space of the Liquor is rendered clear and without dregs, in which the Spirits with a little Salt and Sulphur, do abound; in the mean time, in the settlement or dregs, a little of Spirit and Sulphur, with a greater plenty of Salt and Earth remains. So long as these shall be in their places, the Liquor will be clear, sweet, and Spirituous, but if long kept, or not shut up closely in a Barrel, great part of the Spirits will fly away: in the mean time, by the defect of these, the Saline Particles being exalted, and having gotten a Flux, impregnate the whole Liquor, and make it fowr; for when Beer, as also Wine, goes into Vinegar, it doth not happen because they are wholly deprived of Spirits (for so they would degenerate into a tasteless thing) but because the Tartarous or Saline parts, are carried forth to a Flux, and infect the Liquor with their sharpness; in the mean time, the Spirits being less in power, are depressed, that they cannot resist them. Very hot Weather, Thunder, the noise of great Guns, or the tuning it in the open Air, suddenly makes Beer grow fowr, for by these means the Spirits being disturbed in their equal motion, are dissipated; and in the mean time, the Saline or Tartarous parts, being before separated, and depressed, are moved, and carried forth into a Flux.

Indeed it plainly appears, that the Spirituous parts in Vinegar, are not wholly destroyed, but suppressed only whilst the Saline are placed in a Flux; because from Vinegar, may be Distilled, a Liquor exceeding hot and burning, like the Spirit of Wine, after this manner: With the distilled Vinegar, a Salt is extracted from Minium, or Lead Calcined, of which you have plenty, and shall distil it in a Retort, the Vinous and burning Spirit is driven into the Receiver; the reason of which is, because when the Saline Particles of the Vinegar are united with the Salt of the Lead, the Vinous Spirits yet remaining are then freed; and having obtained their own right, they are urged from their lurking places by the heat of the fire: but those Spirits are not produced from the Lead, because if you give thereto a more vehement fire, the Salt of the Lead, will be melted into a Metal.

But we will return to Beer, from whence we have digressed; to which, how great a perfection happens, by Fermentation, appears by this Experiment: If you take Beer new made, not yet purged by Fermentation, and place it to be Distilled in a Bladder or Cucurbit, only a vapid or tasteless water ascends, without any Spirits, and strength at all: but if you proceed after the same manner with Beer truly fermented, you will have a hot water, and highly Spirituous. And this takes away the objection of some, who say, that water being even impregnated with the Meal of Mault, should not be any more boiled, lest the Spirits should exhale; because the Spirits, before Fermentation, are so obvolved with the more thick Particles of the rest, that they cannot break forth from the Concrete.

The more the Beer is impregnated by the Mault, the stronger it is, keeps the longer without fowring; which is helpt if Hops be boiled therein, from which at first it grows bitter, but afterwards recovers a grateful sweetness; the reason of this is, because the pores of Liquor, which are empty of the Particles of the Meal, when they are possessed by those of the Hops, the consistency is made more compact, and is more full of fermentative Particles; wherefore there is not quickly given any room for the flux of the Salt. But that the Liquor being at first bitter, afterwards grows sweet, happens for this reason; because the Spirituous and Sulphureous parts, supplied by the meal of the Mault, come not so soon to maturity, because of the others mixed with them from the Hops being boiled therein: but when this happens, that they grow to maturity, they easily excel all the others, and impart a sweetness to the whole. Not only Hops
being

being boiled in Beer, keep it long from sowing, but also many other bitter, or sharp things, do the same: for these, forasmuch as they exceed in a Volatile Salt, hinder the flowings of other Salt; wherefore, some are wont to put into the Barrel, a piece of Sassafras Wood, the tops of Wormwood, Broom, the Fir-Tree, the rinds of Oringes, also Spices in a small quantity; by which means, the Drink, tho of a smaller substance, is kept a long while from sowing. Thus much concerning the Preparation of Beer, on the consideration of which, (as also of Bread) we have stayed long, because the Word Fermentation is chiefly due to these. Let us pass next to Wines.

Excepting the Blood of Animals, there are no Liquors that grow hot, like Wines; there is found in none a greater plenty of Spirits, Salt, and Sulphur, or a more remarkable turgescentcy, or swelling up. The Fermentation of Wines, and the handling of them fermenting, are wont to be taught among the Vintners or Wine-Coopers, as a Secret only to their Apprentices, or the Adepti of their Art. Among them there is delivered a certain Physical Science, or Method of Medicine, by which means, the impurities of Wines are purged forth, their heats attempered, or also their defect, or sickness may be healed. There are many ways to be used, besides that of Sophisticating, as a Secret, by which depauperated and tasteless Wines are sold for sound and rich. But as to our Proposition, that the Doctrine of Fermentation might be illustrated, these three things ought chiefly to be considered, concerning Wines: First, Their defecation or cleaning, and their going into parts. Secondly, Their immoderate effervescency or growing hot, from what causes it is wont to be stirred up, and by what means to be suppressed. Thirdly, The declination of them, when they grow worse: and by what remedies they are kept that they do not quickly pass into a tastelessness or Vinegar.

1. As to First, That Fermentation may begin in the Must, there is not (as in Beer) required, the putting to any ferment, for the Juice being expressed from the Grapes, doth so greatly swell up with active Particles or Principles, that it presently of its own accord, grows remarkably hot: but it is a usual thing in some Regions, when the Grapes are trod, to besprinkle them with Quick Lime, by the provoking of which, as a ferment, the Liquor pressed forth, grows more fervent, and is sooner purged. The Must or new Wine, is at first put into open Tubs, for that they cannot be contained in close Vessels, for their great heat or working, which so boyls up, that water over a fire grows not more hot: when the Wine is a little cooler, it is put into more close Vessels, in which it is further purged by fermenting. In the purifying, the Spirituous and Subtile Particles greatly shake the more thick dregs, and dismiss them from themselves on every side, that the Mass of the Vinous Liquor, being made free from the mixture of the dregs, is rendred clear and without dregs. The Fæces or Lees of the Wine consist of Salt and Sulphur, with a little Spirit and plenty of Earth; which whilst the Wines grow hot, being separated by degrees, either by Coagulating themselves mutually, are affixed to the sides of the Vessels under the Species of Tartar, or like Lees or Mother, settle to the bottom. In the meantime the Liquor swimming over them, is very clear and exceeding Spirituous.

Sometimes the defecation or clearing of Wines is hardly brought about, as a Vinous Liquor is not easily freed from the mixture of Tartar: wherefore Vintners are wont to put to the Wines some Bodies that either clear them, or precipitate them, so as the Earthy matter swimming in them, may sooner settle to the bottom: The things which so clarify Wines are of two sorts: for they have either viscous parts, as Glew, the Whites of Eggs, and such like, which stick close to the fæculencies of the Wine with laying fast hold on them, and carry them with themselves towards the bottom: Or else they abound in a precipitatory strength, which while they enter into the pores of the Liquor, thrust forth the more thick Particles from thence, and strike them down to the bottom; as are the dust of Alabaster, Calcined Flints, and such like.

2. Wines tho at first they were well cleared, yet afterwards they conceive immoderate effervescencies, so that the Tartar, being stirred up from the bottom, it at length mingled with them; also the Spirits being loosened, now the Sulphureous Particles, now the Saline being too much carried forth, render the Wines unfavory, clammy or fowr. We will consider these things, from what Causes they come to be so, and by what Means they are Cured.

Wines very often contract heats, when they are full of Tartar or too rich Lees: For Tartar or Lees, tho separated from the Liquor of the Wine, and depressed to the bottom of the Vessel, yet for that they consist of plenty of Salt and Sulphur, they still send from themselves fermentative Particles, by the inspiration of which the Wine is kept in an equal motion of Fermentation: and as the Wines are leisurely ripened, so the Salt and Sulphur which lurk in the Tartar, are by little and little exalted; until at length, being carried forth to a flux, they infect the Vinous Liquor, with a troubled feces or dregs, and compel it to grow immoderately hot, and to boyl up. Against these too great heats of Wines, there is a necessity, that they be presently drawn off or rack'd, from this too rich Lees, and put into another Vessel, or else it comes to pass, by reason of its too great disturbance, the Sulphur being very much exalted, that they become unfavory and ropy; or the Spirit being lost, and the Salt carried forth to a flux, they contract a fowness, and turn to Vinegar.

Neither doth Wine grow more hot than it should do, only from Tartar, or too rich Lees, but by too great agitation, immoderate heat, or by an extraneous or strange Body put to it, and not miscible, or that cannot mingle with it: for by these and other ways, the Sulphureous part of the Wine grows hot, and from thence conceives a fervour, and undue boiling up; for the settling of which, besides the racking or drawing it off, from one Vessel into another, they use to pour plenty of Milk, into the Pipe or Barrel, by whose mixture the heats and tumults of the Wines are presently appeased; but as by this means the Spirits of the Wine are very much overcome, it cannot keep long, but soon after degenerates to Vinegar, or without tast; therefore the Vintners are necessitated to sell presently the Wines mended by this Artifice, and very suddenly to draw them off.

These kind of heats of Wines, tho' they be timely appeased, before they wholly spoil the Wines, yet they leave some viciousness, by which the Vinous Liquor is altered from its due colour and consistency, and is made less grateful to the Palat: for Wines made hot, oftentimes become of a more deep colour, viz. they degenerate from a watery and clear colour, to a Citron or Red, and give to the tast a rankness; all which indeed proceed, from the Sulphur being too much carried forth and exalted: For these kind of distempers of Wines, they proceed after this manner; for the mending the colour, oftentimes simple Milk, or boiled with Glew or fine Flower, is poured into the Hoghead or Pipe; for these procure a certain separation of the exalted Sulphur, and with its whiteness give a clearness, or restore the colour to a brightness. Mucilaginous, clammy, or ropy Wines, are amended by the infusion of burnt Alum, quick Lime, Gypsum, or Plaister of Walls, Salt and the like; for these cause a new Fermentation, that the more thick Particles are thrust forth from the rest, and precipitated towards the bottom. The unfavouriness is helped by the same means.

3. As to the the third Proposition; Wines are depauperated or made poor, when by a long effervescency the Spirit and more pure Sulphur, being exhaled, the Saline Particles begin to be exalted: in this case their languishing strength is sustained with certain Remedies, as it were Cordials.

As the Spirit and Sulphur being too much carried forth, and exalted, is cured by the drawing off the Wines from the rich Lees; so the same being depressed, the Remedy is, that they be put to a more rich Tartar or Lees: wherefore the Vintners are wont to pour the depauperated Wines, destitute of plenty of Spirits and Sulphur, and which begin to grow sour, by reason of the Salts being carried forth to sound and fresh Lees or Tartar; that they might, as it were, anew inspired with Spirit and Sulphur, ferment and recover new strength and vigor; besides they make Syrups of generous and rich Wines, with Sugar and Spices, which they pour among the stale and deadish Wines. Further, for Wines turning to Vinegar, they are said to administer profitably, some other Remedies. *Gratarolus* praises, with many more, Lard and Swines flesh salted, wrapt in Linnen, and put into the Cask: and truly it is probable, that the Sulphureous odour of this doth restrain the flux of the sowing salt; for this end the same Author commends Leek-seed, Pine-nuts, blanched Wheat, boiled Wine, Ashes, the shavings of Willow, and many others; for the salt readily acts on these kind of subjects, and spends its force; even as Virgins sick of the Green-sickness, desire greedily to eat such like absurd things, that may satisfy the extraneous, and for the most part sourish ferment of the Ventricle, but very hurtful to themselves. There remains another kind of Cure, whereby small Wines almost corrupted, and growing vapid or smatchless, recover new vigor for a time, to wit, a portion of Rhenish Wine, or others, very fermentable, is laid up, and hindered from fermenting, from whence it is made a perpetual Must (commonly called Stum) if a little of this Liquor be poured into a Cask of stale Wine, and jogged together, it gives a fresh, and new Fermentation to the whole: so that that Wine will froth and boyl, and shut in a Glass, will leap forth; but the drink mended by this Artifice, is accounted very unwholsom, for that it is apt to stir up an immoderate Fermentation in our blood: wherefore it is prohibited by Edict, that the Wine-Coopers or Vintners make not use of this kind of Sophistication.

It is a usual thing also, to stop up close, in Stone or Glass Bottles, for a time, small Wines, and new Ale or Beer, which being afterwards opened, the Liquor ferments so impetuously, that being almost all rarified into froth, it flies forth of the Bottles: which besides contracts such an acrimony or sharp cutting, that it can scarce be swallowed: The reason of which (as it seems) is this: The turgency or swelling up, and the notable acetoity, sharpness, or quickness of these kind of Liquors, proceeds chiefly from the Salt being exalted, and having gotten a Flux; for when as the Liquor, being full of much Tartar, and little Spirit, is shut up close in a Vessel, all the Particles together are forced to be fermented, and when they cannot be separated, and fly away from one another, they do the more trouble one another, and break themselves into small bits; that by this means the bond of the mixture may be wholly broken; but the little bodies loosened one from another, and as it were freed by reason of the closeness of the Vessel, are forced together: wherefore when the Vessel is opened, all the Particles at once being ready for flight, like Air suddenly rarified, break forth with noise and tumult: and because

the Saline parts having gotten a Flux, by reason of the plenty of Tartar, are stronger than the Spirit and Sulphur, from thence the notable cutting sharpness is caused in the Liquor.

Cyder comes next to the Nature of Wine, to wit, of the smaller sort, which kind of Liquor, is only the Juice pressed from Apples, and brought to maturity by Fermentation: concerning this kind of Drink, it is worth observation, that if it be made of Summer-Fruit, or too much ripened, it will not keep in strength, but presently degenerates into a deadness: but if it be prepared of very unripe, and sour Apples, it contracts a bitterness, for that the Spirits do not sufficiently arise in this, but give place to the salt, having first gotten a flux: but in the other, they are not long enough retained, but wholly fly away, before the mass of the Liquor attains to full Fermentation: but there are Fruits and Apples, exceeding fit for this business, which being indued with a more firm consistency, are not quickly corrupted, neither do they attain their perfect maturity or softness, but of a long time: The Juice of these wrung forth, and put into a Cask, does not grow hot, as Beer, with a great frothy head, but after the manner of Wines, with a noise, like a Pot boiling over the fire: whilst fermenting after this manner, it is made clear, the more light Recrements are carried upwards, and remain in the superficies, as the flowering: but the more thick parts and Tartarous settle plentifully in the bottom; but the more solid Crust, or Coagulated Tartar, is not fixed to the sides of the Vessel; which is a sign Cyder is a more wholesom Drink, nor so infectious to the nervous stock, because it abounds less with a sharp salt than small Wines. The Liquor swimming over these Fæces or Lees settling in the bottom, enjoys it as it were its food, and is kept by its inspiration in strength; from which, if it chance to be drawn forth, it quickly grows sour: for indeed this kind of Drink, is in great danger to be destroyed by the flux, or sourness of the salt: against this ill, to preserve it, some are wont to cast into the Cask Mustard Seed bruised, or Mustard Balls, for that the Volatile Salt of this hinders the flux of the acetous Salt, so that the Liquor thereby presently grows clear, and keeps the longer: another kind of Remedy against the sourness of Cyder, is, that as soon as it begins to grow sour, it be drawn off from its Lees, and kept in close stopped Bottles, with a little Sugar; for by this means it ferments anew, and because, together with the flux of the salt, the spirits being carried forth, are detained from flight, a very grateful sharpness is caused to the whole Liquor. Also, almost by the same preparation, and the like process of Fermentation, a potable Liquor is made out of Pears, which is however above measure sweet, and if plentifully drunk, renders the Belly loose, as if they had taken Physick.

So much for Fermenting Liquors, whose vertue consists in the Spirit being carried forth, and obtaining the height of perfection: there remains other Preparations, whose vigor is placed in the saline part being exalted, and having gotten a flux; among these, Vinegar is of chiefest note, the way of making of which, being wholly unlike the aforementioned, requires a method of Fermentation, very different from those before described: For example, small Wines, or more generous or strong Beer, being put up into the Cask, are exposed in the Summer-time, for a long while to the Suns Beams, or else in the Winter, they are kept near a Stove in some hot place; after this manner, whilst some Spirits evaporate, the rest being put under the yoke, the Saline parts are exalted and infect the whole Mass of the Liquor with their sharpness: but not only Wines long kept, or stale Beer, out of which the spirits of their own accord, begin to go away, but fresh Must, or new Beer, pass after this manner into Vinegar; for the Countrywomen are wont to place without doors all the Summer, strong Ale, and highly impregnated with Mault, in a Cask, by which means they make an exceeding biting and most penetrating Vinegar.

Yea after the same manner almost, our kind of Hydromels, Honied Drink, or Meath are wont to be prepared: to wit, they boyl sixteen parts of Water with one part of Hony, to the consumption of a third part, adding then some Spices, together with a sharp ferment, they place the Cask and Liquor for many days in the Sun, and afterwards in a Wine-Cellar. It seems the Sunning of it is used, that thereby the Saline parts being brought towards a flux, might somewhat restrain the nauseous sweetness of the Hony: and by that means the sweet being tempered with sharpness, a most pleasing tast is afforded to this Drink.

By reason of the sharpness arising from the flux of the Salt, also very many eatable things are wont to be prepared after various manners; hence the flesh of living Creatures, and especially of Fishes when they swell with too much Sulphur, are pickled with salt Brine or sharp Liquors, that the Salt being brought forth, they may become more grateful to the stomach. It would be a tedious business to insist here on particulars; but I will in this place describe a certain noted kind of Oaten Broth, Grewel, or Flumery, which profitably nourishes Feverish, also Consumptive and Hectick People.

This kind of Drink, that it may become gratefully sourish, the Meal of Oats is put into common water for about three days, till it acquire a somewhat sour tast: then, this infusion is placed upon the fire, and with a Ladle is stirred about until it boyls, and when it rises up ready to flow over the Vessel, it must then be poured forth into a Platter, and presently cooled; it will

will appear like Gelly, and may be cut into bits ; which if heated soon melts. In this preparation may be observed, that by a long infusion of the Grain, the saline parts being brought forth, do get a flux ; then these so impregnate the Liquor that the more thick Particles being by the heat brought into its pores and passages, they are so strictly shut up, that they cannot easily sink down, but that the whole mixture becomes like Gelly.

It would also be too great labour to heap together here, the various Condites and kinds of Pickles, for it would be to describe under that rank the whole Art of Cooking and Diet. For in both the only aim is, that for healths sake and for pleasure, the active Particles in our food, may be placed in their vigor and exaltation ; for so they greatly please the Palate, and by a more easie digestion go into nourishment : for this reason, not only Drinks, and Confections of Corn, and Herbs of a diverse nature and kind are thought on ; but also we variously prepare flesh, both boiled and roasted, and add to them sauces, that the Particles, now the Spiritous, now the Saline, being carried forth to a flux, might please the tast, with a certain sharpness. Those which are of a more fixed nature, are brought to exaltation, by Sauces made of Sugar, Salt, or Pepper. They are wont to keep some flesh almost to putrefaction, that by that means, the active Particles being placed in their strength and motion, may become of a more grateful tast. Here might be interwoven, a long discourse concerning Medicinal Compositions, but because this subject, deserves a peculiar consideration, I will say nothing more of it here. Let us next see by what motion of Fermentation and Habitude of Principles, Natural Bodies tend towards dissolution ; or what is the progress of every thing to Putrefaction and Corruption.

CHAP. VIII.

Of the Motion of Fermentation, which is observed in the Death, also in the Putrefaction and Corruption of Bodies.

Natural Bodies in which Spirit, Salt, and Sulphur, are found in but a mean quantity, do not stay long in the same state: for these active Principles are employed perpetually in motion: As soon as they come together, they tend from Crudity and Confusion towards Perfection, for the sake of which, when they have reach'd the height, they are able to come to, they are not quiet in this point ; but from thence they make hast towards the dissolution of that thing. Those which are more volatile do first of all break forth from the loosened bond of the mixture ; then the rest separate into parts, until the form of the mixture wholly perishes: The Spirit being carried forth to the top, flies away first with the water, and the more pure Sulphur, and by its expiration, diffuses a very grateful odour ; afterwards the more thick Sulphur, with the Salt, being loosened from the band wherewith they were tyed, and having gotten a flux, by degrees evaporate, and together disperse a very stinking smell: together with these, the watery parts flow forth, and the frame of the subject breaks, or falls down into Earth, or a *Caput Mortuum*.

This kind of process may be observed both in natural things, and also in Subjects prepared by Art: Concerning Natural things, the disjunction of the Elements, and their separation into parts, may be seen both in the death of living Bodies, or the extinction of life and vegetation ; and also in the corruption of them being dead, and in their reduction to a rottenness.

As in Vegetables, the growth and maturity depend on the combination and mutual cleaving together of the Principles, so the decay and death depend on their going asunder, and separation, in Plants and Fruits ; being by degrees exalted from a crude and sour Juice by Spirit and Sulphur, they come to maturity ; to which a sweet tast and smell, and a pleasant colour happen : then presently the same matter, the Spirit and Sulphur, and the rest of the Elements leisurely flying away from the subject, is soon reduced to a filthiness and rottenness: If after the subtil and more pure Particles of Spirits and Sulphur are flown away, there still remain plenty of Earth and Salt, with some Sulphur, the matter does not putrifie, but grows dry with an hoariness: but if the thick Salt and Sulphur, having gotten a flux, break forth from the Subject, together with the rest, the bond of the mixture being loosened, presently the external humidity, possesses the spaces left by these, and the Body is resolved into rottenness.

Also all Animals whatsoever, have set bounds of their growth and duration: For they ascend from their beginning, by slow increase, to motion and sensation ; then to the strength and exaltation of Nature: in which point they stay not, but from thence, by equal steps, make hast towards their fall.

If the cause of this kind of limitation be required, we say that Mother Nature hath placed in the primigenious seed of every thing, such a stock of Spirit, Salt and Sulphur, which might suffice for the producing the utmost thrills or lineaments of Bodies: so that the growth and ascent of the thing, to its height or *achme* is only an evolution, or unfurling of that radical matter, and protension or stretching it self forth into a greater dimension; in the mean time the little spaces and vacuities, which are made by the protraction of this matter, are filled up by the active Particles, supplied by Nutrition, which also by a continual series of motion are ripened, exhaled, and give place to others succeeding. As soon as this seminal matter is unfolded and exalted to the height, that it cannot be moved, or expanded further, the matter is then brought to the state of its perfection: from thence some Particles of this Radical substance, together with the secondary supplied from the Nourishment, begin to evaporate; and others daily, and then others, being after this manner consumed, both the solid parts, by degrees decrease in their substance, as also the Nutritious Juice and Blood, even decline for the worse, till by a long wasting, the props of the Body, are made dry or withered, and the Blood so depauperated, that it will not suffice for sustenance to the vital fire: just as it may be perceived in a Lamp, if the Oyl being continually consumed, in its place be put Water, the Liquor is rendered poor, and diluted, that it is not able any longer, to cherish at all the flame of the Wick.

When the Life of Animals perishes, (either it expires after the aforesaid manner leisurely, and like a Candle or Lamp is extinguished, the Oyl or Tallow being consumed; or it is choaked by a hasty death, being snatched away by Fate, or the violence of a Disease) presently the Spirits, with Salt and Sulphur, flowing together in the blood; and also planted in every part, cease from their regular motion, and are moved into confusion: then they partly exhale from the pores, with the vanishing heat, and partly being shut up within in the Cavities, inordinately ferment, with the remaining Particles, and make a swelling up of the inwards, and of the whole Body. But afterwards the frame of the solid parts being by degrees loosened, and the Sulphureous Particles, together with the Saline, having gotten a Flux, begin to evaporate; from thence a strong stink and corruption arise. The active Principles, breaking forth by heaps, do often mutually take hold of one another, and being combined in the superficies of the Carcase, produce Worms: at length when they are wholly exhaled from the Subject, what remains falls into dust.

It is a usual thing for Worms to be generated in Vinegar when it is corrupted and lost its strength, which being exceeding small; and somewhat long and smooth like Eels, swim in the Liquor, and may by the help of Glass be exposed to our Eyes; these being seen, it is commonly said, that the sharpness and pricking of the Vinegar proceeds from these little Creatures, which is a vain thought that deserves not a refutation; for they are only to be found in dead Vinegar; and I pray from whence have they their teeth sufficient for the gnawing of Iron? But the whole corrosive force of Vinegar is more truly referred to the Salt having gotten a Flux: in the mean time those little Creatures seem to be begotten by this means; it is sufficiently known, that when very many Subjects are brought to putrefaction, the active Principles being thrust out of doors, yet still affecting their old dwelling, remain somewhere about the neighbourhood, and being joyned together, do often produce living Bodies; wherefore, when moist things putrifie, most often little Worms grow on their Superficies; but in Vinegar the business is a little different, to wit, because the Elementary Particles are more fixed, therefore when the mixture of the Liquor is wholly dissolved, the active Principles, although loosened, yet breaking very hardly and difficultly from the substance, meet together in the bowels of the Subject, and there mutually cherishing one another, cause those little Creatures in the midst of the waters.

Also the Bodies of living Creatures, being prepared for our Food, are disposed towards putrefaction, if they are put up for some days, till the active Particles are loosened, and begin to be in motion, tending to exhalation; wherefore both the Flesh becomes more flaccid, and in eating more tender and soft: and if they are kept longer, till the Saline and Sulphureous parts being carried forth into a Flux, do break out, presently a stinking smell and putrefaction is induced.

There are many ways whereby flesh is wont to be kept from putrefaction; the chief of which are, that it be pickled with Salt or Spices. Things are kept a long time incorrupt and very grateful to the tast, with Salt: Dead Carcases are imbued with Spices, that they may remain a long while in their Sepulchers. As to the first, Brine or salt Pickle hinders the eruption of the Sulphur, and fixes it in the Subject by its embracement, and retains it. Spices, as they consist of very active Principles, stir up a new Ferment in the Subject, the dead Carcase; and the implanted Elements of this, joyn into the society of their motion, and retain many of their Particles flying away, yet longer in the Body: As Salt and Spices are made use of for the preserving long flesh, and Sulphureous things, (which also preserve all other things from Putrefaction) so Vegetables, and their Flowers and Fruits are better conserved with Sugar: for this by cherishing the active Particles of the Subject, restrains them within, and besides, renders the Confections of a very grateful tast.

Minerals,

Minerals, chiefly the solid and hard, because they are indued with plenty of Salt and Earth, with little of Sulphur, and with a less quantity of Spirits, therefore they rarely, or not at all conceive Putrefaction: there is the same reason for resinous things, which tho' they abound in Sulphur, with Salt and Earth, yet because there is but a small portion of Water and Spirits, therefore their frame is not easily loosened, neither are they obnoxious to Putrefaction. Among Minerals, common Water only, falls under this rank: for this, if it stand still, or is kept long in a Vessel, its Salt and Sulphur, though but in a little quantity, having gotten a Flux, begin to evaporate, and together to induce Putrefaction: but so long as water is in motion, these Particles are still involved with others, and so by their mutual embrace, are detained from evaporation.

Artificial things and preparations, are no less subject to Putrefaction than Natural things; for Bread, and all manner of Eatable things or Food, Wine, Beer, and other Drinkable Liquors, also Medicinal Confections, being long kept, first lose their strength and vigor, and then afterwards are Corrupted: concerning which, we may observe these following things.

The more the things are Compounded, and have all the Principles conjoined together, the sooner, and the easier, do they enter into Putrefaction; wherefore Eatable things, prepared of Flesh, Broths, Decoctions of Herbs, also many Medicines made after the Galenical way, are wont (unless preserved with very much Salt or Sugar) to be Corrupted in a short time: In the mean time, Distillations, and Chymical Preparations, which consist of Homogeneous, or not much different Particles, are kept sound a long while.

In Compounded things, if there be too great quantity of Water, things sooner putrifie, for so the frame of the mixture is too loose; so that the fixed Principles cannot take hold of the Volatile, or keep them back from flight: but those in which Spirits abound with moderate Salt and Sulphur, if they are kept in a close Vessel, that they may evaporate but little, continue a long time, as may be perceived by strong or generous Wine. The next to these, are those things which are preserved with Hony or Sugar, or in which the Saline Particles are in great plenty by nature.

Many of these, whilst they are corrupted, are either made Mouldy or Rank, or they grow sower, or degenerate into a vapidness, or without taste: things are made Mouldy, when the subtil Particles in the exhaling, are detained by the more thick, and cleaving together by their mutual embrace on the superficies of the Body, grow into a soft Down or Hoariness, even as Moss is brought forth by Stones, or Wood exposed to moisture.

Rankness or unsavory Taste, happens chiefly in Sulphureous things, for Oily and Fat things, by Heat or Age, become Musty or Unsavory, to wit, when the Spirit being very much exhaled, the Sulphureous Particles are too much exalted, and begin to evaporate.

Sharpness or Acidity is induced from the Salt, being too much carried forth and loosened; for when the Spirit is depressed, or exhaled, the Salt being fused, conceives a Flux, and so brings in a sourness: hence Wine, Beer, Cyder, also Milk, very many Eatable things, and the Juices of Herbs, when they are long kept, or if they are moved by too immoderate heat of the Air, or shaking, do easily grow sower.

Liquid things, degenerate into a vapidness or tastelessness, when the active Principles, are for the most part gone forth, and nothing eminent besides Water and Earth, or of the subtil parts, is left in the subject.

That I may contract what is aforesaid; the corruption of every thing, is only the separation and departure of themselves from one another into parts of the Principles before combined, (the bond of the mixture being loosened) which motion, by reason of the diverse disposition of their breaking forth, (either with or without a stink) ends in Putrefaction or Rotteness.

Where Spirits abound, and that there is, also plenty of Sulphur and Salt, and the Particles being loosened from their bonds, break forth in heaps; the mixture putrefies with a stink; also if it consist of a thick substance, so that all the parts are not rightly ventilated, it conceives a heat from the Putrefaction: in such a Corruption, the stink proceeds from the exhalation of the sharp pointed Sulphur, or made pricking with the Salt; Putrefaction follows, for that the external humidity enters into the place of the Particles flying away: But the heat is produced by the Sulphureous Particles being moved together in heaps, and being shut up within the subject, that they gather together, and being united, act more strongly. But if there be in the subject a lesser proportion of Salt and Sulphur, so that when the mixture is loosened, the Particles are moved more slowly, and evaporate leisurely, the Body grows dry, and is reduced to a wasting, without any ill smell, putrefaction or heat.

It will not be from the purpose to inquire in this place, from whence some empty Vessels, and more moist bodies, by lying long, conceive a certain stink without Putrefaction; also other things being put into them, or lying near them, are wont to partake of their Evil; for which affection, a proper Latin word is not easily to be met with; in our Idiom it is called Mustiness, and in some sort seems to be designed by the word *Mucor*, unless that *Liquor* or *Mucor*, points at Bodies

Bodies infected with a certain Down or Hoariness, (which we call Mouldiness) which here never happens. The consideration of this matter is not improperly referred to the Doctrine of Fermentation, for this Tincture or Impression of a stink, unfolds it self far abroad, as if it were a certain Ferment, that the Vessel but lightly imbued with it, infects whatever Liquors are put into it, and infusions of them, even new and often iterated; we may observe a twofold effect of this thing: For sometimes the Vessels being almost empty, at first vitiated, afterwards infect most Liquors, which they by chance receive, with a musty odour: sometimes more moist compacted, and solid things, being kept long, somewhat close in a Cellar, contract this vice of their own accord; when in the mean time the contagion is not perceived to be in the place where they were kept; which things either may become musty, not because they are corrupted, for in most Spirit, Salt, and Sulphur, being yet contained, in the bond of mixture, the frame of the matter is kept whole, but the vice only consists in this, that from the subjects after this manner disposed, *effluvia's*, as it were, aculeated or sharpned, fall off, and therefore become ungrateful to our smell and taste.

First, that any Vessel may conceive a mustiness, there seems to be required in the first place, that its inward hollowness be large, and its mouth narrow; to wit, whereby a passage may lie open to the outward Air, and rest may be granted to it, being entred in: for Jugs with broad mouths, also Bottles close shut, do not easily get this fault. Secondly, that besides the more ample inward hollowness, the sides of the Vessel be indued with pores, and very small passages; for in these kind of little spaces besmeared with humour, the Air being strictly shut up, remains more quiet, and is apt to stagnate: Wherefore Glass Bottles are not so apt to suffer this evil, as Wooden, or Stone Bottles. Thirdly, that some moisture, tho' very little, stick about the sides of the Vessel, or in its bottom, whereby the Air being entred may be intangled: for if the Bottles be hung up, with their mouth downwards, that all moisture may drain out, they will never be musty.

In the second place: when Bodies, without any contagion of a Vessel, contract a mustiness or mouldiness of their own accord, we may observe, first, that they are of that kind, which consist of Heterogeneous Particles, that is, a mixture of all the Elements together; because the parts of Vegetables and Animals, and preparations of them, easily receive this evil; Minerals for the most part remain free from it: Secondly, that there be plenty of humidity in the concrete, for the more dry continue a long while without any hurt: Thirdly, that the Bodies be either kept in a heap unmoved for a long time, or else in some close Cupbord, or Cellar, without Air; for so Wheat or Grain, in a heap, unless it be often moved, as also all Eatable things, being put up in a close place, quickly grow musty.

According to these positions we conjecture, that mustiness is made an affection to a moist inanimate Body, from the ambient Air, being admitted within its pores, and being got in, there stagnating, whereby the Elementary Particles of that mixture, being combined together with those sent in by the Air, are exalted into the Nature of a Ferment; that they diffuse themselves on every side with wonderful activity, and their *effluvia's*, as it were sharpned, ungratefully strike against the sensories of the taste and smell. When therefore, some Subject becomes primarily musty, a certain portion of the Air placed near, and hindered from ventilation, enters into its pores and passages, and there being intangled with a tenacious matter, is wholly shut up within the substance of that Concrete. From the mixture of the shut-up Air, the implanted little Bodies of the matter, especially the sulphureous and saline, acquire new heads; that afterwards, when they are exactly to be mixed with no other Body, yet very greatly Fermentative, tho' intermingled with any other thing, retain their own Nature, and being diffused through the large substance of the matter, infect the whole; to wit, they dispose by that means, the Particles of that new matter, that they being armed with sharp points, bring in like manner a trouble to our senses: But in the mean time, from the mustiness, whether primarily arisen, or received by contagion, the mixture of the thing is not dissolved, nor the Principles dissipated; yea, those things which are wholly tasteless, do scarce at any time become musty: the musty smell depends chiefly on the active Principles, disposed by a peculiar right, by the involved Air and their *effluvia's*; wherefore, if they almost wholly fly away from any subject, that is rendred almost incapable of this affection.

There may be observed a certain likeness between mustiness and an Empyreuma, or taste of fire or burnt-too, for as in this, the Particles of the fire being intangled, and included by a tenacious matter, by their long stay there, pervert the implanted little Bodies of Salt and Sulphur, from whence their *effluvia's*, strike our senses with an ingrateful sharpness; moreover, being mingled with other things, they affix to them, the disposition of their pravity; so in mustiness, the Particles of the Air, being obvolved with a viscous matter, and stagnating, they change by their presence the saline and sulphureous little Bodies, from their due temper, whereby they being as it were gifted with sharp prickings, do strike bitterly our sensories, and being exceeding fermentative, diffuse their odour to others: the alteration being either way contracted, can scarce be blotted out, by any mixture with other things, or emendation by Art: The

chief means of helping of either, is by placing it in a reciprocal trajection, *viz.* Empyreumatical things, or tasting of the fire, are to be a long while exposed to a more moist Air, whereby the Particles of the fire may exhale: and musty things are to be held to the fire, or put to such things which may sweeten their Nature, to wit, quick Lime, Sulphur, or Stygian Waters, by which the parts of the included Air are driven away, and so the remaining little Bodies of the mixture are wont to recover their pristine state; wherefore, if musty Liquors are distilled, the Water falling into the Receiver, will be deprived of that stink: But the smatch of Fire, or Empyreuma, is not so easily mended by this Artifice.

So much for Fermentation, and the motion of the Principles, for as much as within the Confines of the same Subject, they dispose it, either to maturity and perfection, or towards dissolution and corruption. It now follows to treat of the motion of the same kind of Particles and Principles, for as much as some of one Body do act on others of another Body, and by dissolving the mixture, do wholly draw them forth, and send them outward, or by precipitating it causeth them to go into parts.

CHAP. IX.

Of the Motion of Fermentation, as much as is to be observed in the Dissolution of Bodies.

FOR the Solution of Bodies, there are two great solvencies, or Menstrua, which exist from Nature; to wit, Water and Fire: Fire, if it be next and immediately applied, destroys most Bodies, drives away the Principles one from another, and as it were dissipates them into Air, Earth only, with a little Salt, being left behind; if it be mediately applied, it brings away some Particles, so that in the mean time others remain: After which manner it serves chiefly for Distillations, and Chymical Operations, and is also used in the Preparation of necessaries for our Food, both about the Boiling and Roasting of Meats. Water does not so readily destroy Bodies, but it draws forth some parts from the Subjects, and receives them into its own Bosom, and firmly retains them for various uses: But as it does not easily penetrate every Body, but leaves almost untouched those which are of a more fixed Nature, various ways are thought of, whereby the Menstruum of Water is made sharper, and is rendered fit for the dissolving of any Bodies whatsoever. For by means of the Bodies, which it ought to dissolve, and of the parts, which it ought to receive in it self, it is armed as it were with some Weapons; with which it is able to unlock any Subject, and to possess now these, now those Particles. The Menstruum of Water is sharpened with Spirit, Salt, or Sulphur: to wit, either with each of these, or with more of them joyned together; we will first speak of the watery Menstruum, with the various sharpening of it, and afterwards of the fiery dissolvent.

Common Water most easily dissolves the more simple Bodies, except Sulphur; and hides their Particles, in its pores and passages; it readily receives Salts of every kind, and easily imbibes Spirits; it loosens the frame of Earth, and cherishes its more tender little bodies, in its embrace; but it is hardly mixed with Fat, and Oily things; and receives not their Particles, but by the coming between of others, but drives them forth to its superficies; as not miscible, or thrusts them down to the bottom.

Water in some measure enters the more compounded Bodies, whose frame is somewhat loose; and then receives into its bosom, some not simple Particles, but resembling the nature of the whole mixture: hence most Vegetables, also parts of living Creatures, and some Minerals, being put into common Water; do impregnate it with a certain vertue; and from most Metals, by a long maceration, it takes away some strength, though but small. Some Bodies are dissolved by Water, which yet a sulphureous or spirituous Menstrua leave almost untouch'd; as the Gums *Tragacanth*, *Arabic*, &c. also Salts and Sugar.

The first and most common way of sharpening, whereby simple Water may more easily enter the Bodies to be dissolved, is, that it be furnished with fiery Particles, or darts of adventitious heat; for so it is driven more deeply with a certain force, into Bodies, and destroys some thrids, as it were the smallest mites, in their most inward recesses. Wherefore we are wont to boil for a long while, the matter to be dissolved in water, or at least to infuse it in warm water, by which means, the more tenuious, and certain subtil Particles, which resemble the nature of the subject, are easily drawn forth, and impregnate the water, with the vertue of the whole mixture.

So much for the simple, or natural Menstruum of Water, to wit, for as much as its activity is wont sometimes to be promoted, by fire or adventitious heat. But this cannot be so simple, but that

that it contains in it self some Particles of another kind ; as may be gathered from its easie Putrefaction ; for oftentimes it is impregnated with spirituous, sulphureous, or saline Breathings, contracted from the Air or Earth ; that for the drawing forth the Tinctures of very many things, sometimes it excels an Artificial *Menstruum* ; for that Acidulous or Spawish Waters, Mineral Waters, Rain Water, and *May Dew*, are of frequent use among Chymicks, for the remarkable faculty of dissolving, with which they are strong. Besides, 'tis a vulgar observation, that some Waters most easily dissolve Sope, and being thoroughly mixed with the same, causes in the liquor a great spume or froth ; such, if they be rubbed between the fingers, feel soft and gentle ; but other Waters, which being handled with the hands, are more harsh, refuse the mixture both of Sope and Oyl ; and so are accounted unprofitable for the washing of Cloaths : these sort of Waters, if they should be evaporated in a Glass, oftentimes affix a Crust to its bottom and sides ; because they are impregnated, more than they ought, with saline Particles, with which, when the saline parts residing in the Sope combine, the sulphureous are carried away, and they being excluded, the pores are thrust forth as not miscible, to the top of the Liquor. When Flesh is boiled in these Waters, it grows very red ; which Tincture indeed being thence contracted, is a sign, that those Waters are somewhat imbued with Vitriol, or some other kind of Salt. But we will pass to Artificial *Mensura's*, in which the watry Liquor is furnished with Spirit, Salt, or Sulphur, being gathered apart, or many of them together.

The spirituous *Menstruum* of Water is made, when from a Body swelling with Spirits, a clear and limpid Water is distilled ; as from Wine, or strong Beer, or other Bodies truly fermented, and brought to exaltation : The kind of dissolvent is hardly to be had so sincere, but it is mixed with the Particles of more pure Sulphur, and sometimes of a volatile Salt. The former kind of Liquor is called Spirit of Wine, which being subtil, and very penetrating, easily enters the Bodies, and parts of Vegetables, and also of living Creatures, but hardly Minerals, or not at all : it extracts from many things, not any Particles, or resembling the Nature of the whole mixture, (as common Water) but chiefly Spirituous, and Sulphureous, the rest being almost untouched ; wherefore, it is wont to be used for the resinous *magisteria* of Vegetables, (which it draws forth almost sincere or without mixture, under the form of Gum or Rosin) in the mean time, it is not so fit as common Water, for the extracts of Plants, which are not so indued with Sulphur : from sulphureous things, as Benzoin, Sulphur, Olibanum, Styrax, Amber, and the like, it draws forth excellent Tinctures : It dissolves the fixed Salts of Herbs, also of Pearls and Coral, before prepared with Vinegar, by a long digestion, and receives their Tinctures into it self : it leaves Sugar, and Gums, being dissolvable in Water, almost untouch'd. But there is another spirituous *Menstruum*, that is sharpened with a volatile Salt, such is the Liquor which is distilled out of Blood, Harts-horn or Soot ; it is far stronger than the former, and cuts most Bodies, except Metals, into parts, and oftentimes destroys the forms of the whole mixture : yea, it most excellently dissolves secondarily, the most fixed Metal, to wit, Gold, being first reduced into a Calx, by its proper *Menstruum*, and reduces it into a Tincture, or potable Liquor.

They are accounted Sulphureous *Mensura*, which are brought forth of Sulphureous Bodies, under the form of an Oyl : these are prepared, either by distillation, such as are chiefly the Oyl of Turpentine, Juniper, and the like ; or by exprellion, such as are wrung forth of Olives, Almonds, and other Fruits, or Seeds of Vegetables. Things distilled are of more efficacy, than preparations by exprellion ; either of them draw forth some Particles, from Vegetables, or Animals ; by the vertues of which, these Oyls being impregnated, they are made fit for Medicinal use. Yea they are conveniently enough made use of, for the extracting of the Sulphureous Particles of Minerals, which sometimes they draw forth sincere or unmixed : But if Oyl of Turpentine, or Lin-seed Oyl, draws forth by dissolving, the combustible part of common Sulphur, in the mean time, the remaining saline parts, and untouched by the *Menstruum*, grow into Crystals ; as is obvious to every one, in the preparing the Balsam of Sulphur.

Mineral Bodies, in which the bond of Concretion chiefly depends upon Sulphur, as are the Fire-stone, Antimony, common Brimstone, and the like, are in some sort dissolved by a sulphureous *Menstruum*, which draws forth of the Body, Particles of the same kind, the saline being almost untouched : wherefore Oyl of Turpentine, Lin-seed, &c. draw forth a Tincture from these ; in the mean time, saline *Mensura*, such as are distilled Vinegar, or Stygian Waters, profit little for the dissolving their Bodies : but that these, unless before Calcined, hardly are touched. But on the contrary, where the frame of the mixture consists of a saline bond, such as are Iron, Copper, and the like, saline *Mensura*, as *Aqua Fortis*, Spirit of Vitriol, Salt, &c. receive in the dissolving, the Particles of the same Nature into themselves, the sulphureous being almost untouched. This plainly appears, in the solutions of Metals, but chiefly and remarkably in Camphire, which Stygian Waters reduce into a Liquor, in form of an Oyl, swimming on the *Menstruum* ; to wit, they dissolve its frame, and receive some saline parts, on which the Concretion depends, into themselves ; in the mean time the sulphureous being untouched, they are gathered together apart, on the superficies of the Liquor : There is something to be wondered

at concerning Antimony: to wit, that its Concretion being very irregular, that Mineral becomes exceeding unlike, not only to other mixtures, but also to it self; for it is very lax, nevertheless much compacted; it lies open to the least injuries, yet is almost impervious to the greatest, so that it may equally number its losses, with its Victories: some of its Particles lie so loose, that they are brought away by any Oily *Menstruum*, or by a common *Lixivium*, or Lie: others in the mean while do so pertinaciously stick together, that *Aqua Fortis* cannot touch them, only *Aqua Regia* being poured upon it can know it; which so strongly resists it, that the fume raised up from thence, presently obscures the whole Room, wherefore there seem to be in this, parts wholly of a different Nature, some imperfectly mixt, viz. Earthy and Sulphureous, which are easily loosened by a fit solvent; in the mean time others wholly Metallic, perfectly mixt, coming near in some sort to the Nature of Gold it self; which therefore are only to be dissolved, by a fit *Menstruum* of Salt.

The saline *Menstrua* are of divers kinds and natures, viz. of Vegetables, Animals, or Minerals. Among Vegetables are eminent, the sower Juices of Fruits and Herbs, Counterfeit Vinegars, acid Liquors distilled out of ponderous Woods, as Guaiacum, the Oak, and Box; in all which, the saline Particles having gotten a Flux, either by Art, or by Nature, give a notable sowness: or the Vegetable *Menstruum* consists of Salts of Tartar, or made by the cineration of Herbs, and dissolved; which by the Fire are very much whetted, and acquire an acritude; in these the saline Particles are fixed, and in a condition opposite to a Flux. To the rank of Animals I refer the Spirit of Urine, Harts-Horn, &c. which although they are impregnated with Spirits, yet they take their chief forces from a Volatile Salt. But the strongest saline *Menstrua*, are drawn forth of Minerals, such are acetous Liquors, which are most strongly forced by fire, out of the Salts of Nitre, Sea Salt, Alumn, Chalcarth or Vitriol, and such like.

Those which are drawn out of Vegetables, as Vinegars, and acid Liquors, do best of all dissolve Corals, Pearls, Shells, and Shelly substances: because in these there is great plenty of Alcalizat Salt, with which the fluid Salt, which abounds in those kind of acetous *Menstrua's*, desires to be most strictly united; wherefore they being applied to the body to be dissolved, enter its pores and passages, loosen the Complications of the Particles of the Alcalizat Salt, and snatch them into their own Embrace. Even after the same manner, the fluid Salt in a Vegetable *Menstruum*, approaches the Volatile Salt in the Horns of Animals.

These kind of *Menstrua's* do corrode some Metals towards the superficies; but do not so potently unlock their bodies by dissolving, as Stygian Waters, some sulphureous subjects, being before loosened by Calcination, do enter aptly enough, and from thence carry forth saline Particles. Wherefore, for the Salt of Tinn, Lead, Antimony, Soot, and others, being first reduced into a *Calx*, we use distilled Vinegar.

The Salts of Tartar, and the fixed Salts of Herbs, although they serve for præcipation, rather than dissolution, yet because they consist of sharp, and very penetrating Particles, they are of egregious use: For watry *Menstrua's* are chiefly sharpened with these, for the extracting of the Tinctures of Vegetables. And altho' Bodies which abound with an alcalizat Salt, as Pearls, Corals, &c. are left wholly untouched by reason of the Homogeneity or agreeableness of the parts in either; and that also, they but little gnaw, only on the superficies, being put upon Metals, and grow together with their Salt, and Sulphur, into rust; yet sulphureous Bodies they readily enter, so they be loosened by the fire, and unlock and pull asunder their joyntings or complexions; wherefore, for the making of the Milk, or *Magisterium* of Sulphur, the Salt of Tartar most excellently conduces.

Saline *Menstrua's* are most strong, which are forced by distillation out of Minerals; to wit, out of Vitriol, Nitre, Sea Salt, Alumn, Arsenick; Acetous Liquors are distilled either from these single, or from many of them mixed together; which as they are of the highest sharpness, like to fire, readily enter most bodies, but chiefly Metallic bodies, and such as consist of a saline bond, and dissolve them easily into most small parts. These Liquors are only saline Particles, which being driven by the force of heat, from the embrace of their Earth, having gotten by that means a Flux, are converted into water: as actual fire chiefly assaults sulphureous bodies, and by destroying the body, draws to it self the consimilary parts; Stygian Waters (which are also called potential fire) easily pull asunder bodies, which very much abound with Salt, as Metals; and break them, inviolable by fire, into most minute parts.

Concerning the Solutions of Minerals, we may observe, that their frame is not easily destroyed, or loosened into parts, as other Concretes of Nature; but for this, most strong *Menstrua's*, and those chiefly Acetous, distilled from Salts, are required; the reason of which is, for that the Concretion of Minerals, depends mostly upon great plenty of Salt, binding the rest of the Particles, as with a bond; wherefore their substance is more solid, more hard, and compact, and only gives place to a saline *Menstruum*. When any Mineral, or Metal is dissolved, the fluid Particles of the Salt, in the *Menstruum*, most easily enter the most strict Complications of the fixed Salt in the mixture, and impervious to any other solvent, loosen them from their binding, and snatch them into their Embraces: after this manner, the Particles of the Salts being united, and

and dilated by the Liquor; are hidden in the pores and passages of the *Menstruum*; and together with these, stick, and are also sucked up, by the *Menstruum*, the more pure and minutely divided bodies of Earth or Sulphur, which were in the mixture; in the mean time, the more thick, and more stuffed with Earthiness, are præcipated to the bottom of the dissolving Liquor: wherefore Gold and Silver are wholly devoured by the *Menstruum*; but Iron, Lead, &c. and also Metallic Recrements, send forth from themselves, in the dissolving, Heterogeneous Particles, as so many off-scourings: when Minerals are broke into parts by this means, the divided Particles, and most minutely broken, (so long as they equally cohere with the Particles of the fluid Salt, which are in the *Menstruum*) being dispersed through the Liquor of the *Menstruum*, and hidden in its pores and passages; are sucked up, and rendered invilible. Yea also, the humor of the *Menstruum* being taken away, the remaining *Calx*, which consists of the Particles of a mixt, and fluid Salt, combined together, is dissolved in any other Liquor: but if after a Metallic solution, the fluid Salt be drawn off, from the Particles of the thing soluted, or by Calcination, it neither poysses any Liquor it is put to, with a new adjection of fixed Salt, nor do the little bodies of the thing soluted fall through the pores of the *Menstruum*, nor are they lastly sucked up, by any Liquor added to them.

But that among Metals, some are corroded by any acetous Liquor; in the mean time others, as Silver and Gold, require a peculiar solvent, as it were to be unlocked by an appropriat Key: and what is more wonderful, common *Aqua Fortis*, which eats Silver, leaves Gold altogether untouch'd: then the same Liquor by an addition of *Sal Armoniac*, is made a proper dissolvent of Gold, and has no power upon Silver: The reason of those may be thus understood: Gold and Silver are more compact Metals, very much cleansed from earthy matter; wherefore they are not broken into parts by any solvent, but only by those kind of *Menstrua's*, which consist of a Salt homogeneous or agreeable with them. But as the frame or substance of Silver depends upon a Vitriolic Salt, and that of Gold, on an Armoniac Salt (or of a more perfect kind; to wit, such as is wont to be most strictly complicated with Sulphur) hence *Aqua Fortis*, so long as it is strong with a Vitriolic vertue, combines with the Salt of the Silver, and therefore unlocks its frame or substance, but doth not loosen the concretion of Gold, which depends upon an Heterogeneous bond: If that to this *Menstruum*, *Sal Armoniac* be added, the power of the Vitriolic Salt is blotted forth, and the saline darts of the solvent are made fit only for the Gold, the Silver being untouched.

When Minerals are corroded by acetous *Menstrua's*, we are not therefore to think, the same always to be resolved into Elementary parts: that the Salt and Sulphur of them, may be had sincere or unmixt, by this means (altho' some boast, that they are easily able to shew such Analyses of Metals) for that it appears to our observation, and frequent experience, that many of these are of so compact and solid a Concretion, that they cannot be broken, but into integral parts: as for example, Gold and Quicksilver, after what manner almost soever handled, when they are reduced into manifold Calxes, will at last by a strong fire acquire their proper forms: viz. the saline Particles of the *Menstruum*, loosen the bond of Concretion, whereby the most minute integral parts of the mixture stick one to another; but the same solvent, is not able in all things, to break asunder the *Copula* of the first mixture, whereby the Elements are mutually bound together: so that for the most part Metallic Calxes, are only little bodies of the Concretè, broken into most small little Globes, being involved by the saline Particles of the *Menstruum*: Wherefore, fire being applied, those corrosive Salts being pulled away from their Embrace, are wholly driven away; then the Metallic little bits, or dust, as so many little particular Globes being fused, by the intense heat, coming together into one Mass by melting, resume the Species of the Metal: wherefore, they who commonly affirm, that the Salts of Minerals, for the most part, are only the saline Particles of the solvent, conjoyned with the Metal, reduced as it were into fine flower, without doubt speak truth in the preparations of Sol and Mercury, or of Gold and Quicksilver; also the Salt or Sugar of Saturn or Lead, is nothing else: But that sweetness comes only from the Vinegar; for if in the distillation of Vinegar, the joynings of the Vessels are closed with Clay, and Salt, Chaulk, and Horse-Dung, on the superficies of this, grows together a most white Salt, wonderfully sweet, in every thing like to that Sugar: but from some, viz. from Iron, Copper, and Silver, are prepared fictitious Vitriols, which are for the most part saline: For that the same, by distillation, may be forced into acetous Liquors, as the Metallic recrements.

Besides the solvence hitherto recited (which, by means of the Particles, which are strong in them, act upon a peculiar and determinate matter) I know that Chymists do boast wonderful things, of a certain universal *Menstruum*, by whose inspiration, every body whatever, may be easily reduced to its Principles, or first Elements: And tho' *Helmont* have bragged, that he had attained to this Secret by his own Labour, and now daily the Adepts of Chymistry, do aspire to this end; yet the hopes and endeavours of most, have failed them in this work, even as in the Philosophers Stone. There are also some other famous *Menstrua's*, viz. The *Aqua Vita Tartarified* of *Quercitan*, and his Philosophic Vinegar, which are of noted use in the preparing of Medicines;

Medicines; but since I know nothing, or any strange thing they have done, in the dissolution of Bodies, we will pass them over.

So much concerning solvent *Menstrua*: about bodies to be dissolved, a certain provision should be instituted; whereby indeed their complections may more easily be unlocked, and cut into most minute parts: Wherefore the Concrete is now pounded into powder, now cut into little bits, that the way might lye open for the solvent, to its most inward-recesses. If that the frame of the subject be harder, and more strict, that it will not give place, but of a long time, to the *Menstruum*, before the dissolution is begun, there ought to be administered some aperitives, or openers, whereby the Concretion may be first loosened, and somewhat opened: wherefore, the Tincture of Steel, is more easily extracted, if its filings be sprinkled with the Juice of Limons, or the Spirit of Vitriol: in like manner Harts-Horn, or the shavings of Ivory, are handled when we would have the Decoctions of them quickly made: when formerly I have been very solicitous about this thing, *viz.* that I might render the more hard bodies easily soluble, in any *Menstruum*, and that I had especially tryed many things about Iron; after several experiments, at length, by a certain chance, and almost thinking of something else, I found out a preparation, whereby without any Corrosive, or Acid Liquor, by the mediation only of a gentle heat, the body of Iron is opened, that being reduced into powder, gives immediately a tincture, to any Liquor, that neither Salts themselves, are sooner dissolved in common water: By this means, I am wont to prepare suddenly, in great quantity, Mineral waters, which exactly resemble our *Tunbridge Spaws*; and to render Wine, Beer, Milk, or Whey, with no trouble Chalibeated. By this means, Syrups, Tinctures, Extracts, or *Magisteria* out of Steel, are most easily to be had. Moreover, plainly by the same Artifice, Corals, Pearls, Eyes, and Claws of Crabs, and all shelly things, are prepared, that their powders presently impart to any *Menstruum*, a tincture, or the virtues of the whole Concrete. And in this preparation, no strange quality is introduced to the Subject, nor its own proper quality lost.

When I had, by this means, learnt to unlock all Bodies whatsoever, consisting of a saline bond, presently from the Analogy of this, was made known the means of unlocking Subjects, whose Concretion is wholly sulphureous: for I am wont so to prepare common Sulphur, that its powder immediately impregnates any Liquor, with the tincture and vertue of Sulphur. The Spirit of Wine, suddenly contracts a deep colour, and very red, that being put into it. Common Water by the infusion, or decoction of the same Powder, is rendered clearly sulphureous, and gilds Silver, and by this means, from that Tincture, a præcipitation being made of White Wine, or Vinegar, the Milk of Sulphur is easily prepared, in great quantity. Out of sulphurated Wine by this infusion, I make a Syrup, than which there is scarce found a more excellent remedy, in the distempers of the Thorax. By this means, Tinctures, Extracts, Magistries, are prepared from Sulphur, with no labour, and without any smatch of the fire. By the same way Preparations from Amber, Benzoin, and other sulphureous things, easily dissolvable in any *Menstruum*, are composed. But enough, and too much of this: we will now pass to the other great dissolvent of Nature.

CHAP. X.

Of the Nature of Fire: and by the way of Heat, and Light.

WE may almost pronounce the same thing of Fire, what the Philosophers of old did of the first Matter, to wit, that it was potentially every where, and in all things; but in none, in act. For among these sublimaries, Fire hath got no existence of its own Nature; or certain means of duration: It is produced almost in every Subject, but is retained long in none, but it suddenly vanishes, and expires; yea, unless some external accidents, oftentimes should concur for its production, I think it had not at all been in the World. Some have dreamed, that its Sphear is scituate under the Moon: but this was introduced only, for the making the Hypothesis of the four Elements: for such a thing seems consonant neither to Sense, nor Reason. That we may rightly search out the Nature of Fire, we must seek in what Bodies it is chiefly to be found, and how they are disposed; and then we may proceed to the unfolding its essence.

The Subjects most convenient both for the producing, and the maintaining of Fire, are of that kind, in which there are very many Particles of Sulphur, and but only a moderate portion of Water, Salt, and Earth: for these do hinder its inkindlings, and being plentifully poured on it, extinguish it being inkindled: Wherefore Bituminous, Fat, and Oily things, quickly take
Flame

flame: so also Chips, Straw, light and dry Wood: in the mean time, Metals, Minerals, the Glebe of the Earth, Dung, wet Straw, and green Wood, are hardly, or not at all, to be inkindled.

Secondly, We observe, that all the time the Fire continues in the subject, sulphureous Particles fly away in heaps, and from the departure of these, the substance of the burning body is by degrees destroyed; in the mean time, very much of Salt and Earth, remains in the form of Ashes, after the burning.

There is a third Observation, that when the sulphureous Particles are wholly, or for the most part flown out of any subject, the burning wholly ceases, and the form of fire is quite destroyed; nor can it be renewed in the remaining matter, wanting of Sulphur.

Fourthly, We will note, that sometimes some Bodies conceive a burning without the advent of another fire, only by their own effervency, and by the intestine motion of the implanted Particles, and of their own accord are reduced into Ashes; as when wet Hay is laid up close, it first grows hot, then afterwards breaks forth into smoke and flame; or the Wheels and Axel-trees of Carts or Wains, being heated by too great agitation, are inkindled.

According to these Positions, we may affirm, that the form of fire, wholly depends upon sulphureous Particles, heaped up in any Subject, and breaking forth from it in heaps: and that fire is no other thing, than the motion and eruption, of these kind of Particles, impetuously stirred up. For Sulphur is of an exceeding fierce and untamed Nature, whose little bodies, when (the yolk of the mixture being shook off) they begin to be thickly heaped together, diffuse themselves on every side like a torrent, break whatsoever obstacles are in the Subject; destroy whatever comes in opposition, or fling it down headlong. Nor do they only unlock their proper Subjects, but also lay open the gates and doors of any other Subject near, that they can reach to, and there incite to the like fury, all the consimilary Particles of Sulphur, and provoke them to an eruption: wherefore fire every where inkindles fire.

The sulphureous Particles, while they, heaped together within the confines of their subject, or on its superficies, are agitated with a rapid motion, but are detained by the Embrace of other little Bodies, from a more free eruption, and more aggregated, constitute the form of fire; as is to be seen in burning Coals, or in glowing Iron; but when these sort of Particles fly way by heaps, from the same subject, and bound together, they produce flame, which is only an heap, or rather a torrent, of the Particles of Sulphur flowing together, and conjunctly flying away: if Watery, Earthy, and saline Particles, are commixt with the sulphureous breaking away, and are able to disjoyn and separate them, only smoke is excited; which afterwards, the sulphureous little Bodies more plentifully breathing forth themselves, and getting together, breaks forth into flame.

The inkindling of Fire happens very many ways. The first and most simple is, when from hard Bodies struck one against another, but ofteneft from a Flint struck against Steel, sparks of fire break forth; which being received in Tinder, made of a Linnen Cloth burnt to blackness, dilate themselves, and then a Match, or sulphurated thing, being applied, they cause the inkindling of a flame. Secondly, A Fire often happens in dry Wood, and dry things, when by the too great attrition of the parts, and agitation, being made hot, they conceive an inkindling of their own accord. And thirdly, when Bodies abounding with Sulphur, as Hay, or Flax laid up wet, (of which mention was before made) grow hot of their own accord, and afterwards are inkindled. The fourth way, is the most usual, of introducing fire into any Subject, that it may be inkindled by another fire. We will a little more consider the several processes of these.

1. Hard Bodies struck one against another, shake forth little sparks of fire: as a Flint with Iron, or with a Flint; *Indian Canes*, the Fire Stone, and many other things. The reason of this is, because the Particles of Sulphur, which reside in the Superficies of a hard Body, if they are smitten by another hard Body, are not able to go back inward, (because in hard things there is not afforded any cession of the parts, from place to place) nor can the smitten Particles of Sulphur evaporate by degrees; but that by reason of the vehemency of the stroke, they are necessitated to break forth in heaps: Wherefore, when by this means, many of them are moved together, and are aggregated, they exhibit the apparition of fire. The sparks being received into the half-burnt Linnen or Tinder, are dilated into a greater fire, for that the sulphureous Particles, in such a subject are eminent, and are brought, as it were, to the very top it self of eruption or breaking forth, wherefore by the least spark being moved or stirred up, a way being made they fly away.

The very same reason is for Wood, being made hot, and afterwards fired, by too great attrition; by which means, the Axel-trees and Wheels of Chariots, or of Mills, are frequently fired: for the Sulphureous Particles, being by this means very much moved, are more thickly heaped together; and when, having as it were made an Army, they are able to remove, or strike away the rest, they presently break forth in Troops, and by their going away, cause a burning.

In Hay or Dung laid up wet, the Particles of Sulphur very much abound; which having gotten the watery Latex for a Vehicle, run themselves into motion; but when for want of Ventilation, they cannot by little and little exhale, being straitned within, and so brought into their exaltation, they are able to joyn more one to another, and mutally to incite themselves: then afterwards, being very much heaped together, they unfold themselves more largely, and begin to break the Dens of the Subject, and so produce a burning. For it is to be observ'd in any Subject, when the Particles of Sulphur, being more slowly moved, fly away by degrees, neither heat, nor fire, but only a driness, and leanness succeed. But if they are more rapidly moved, than that they may be able to exhale leisurely, a heat is stirred up in the Subject: then if yet they are agitated more vehemently and impetuously, and being more thickly agglomerated, or heaped together, they break forth in heaps, a deflagration or flame follows the heat.

Fire being enkindled in any Subject, enters and enkindles whatever Sulphureous thing is next it. For as Saline *Menstrua*, viz. Stygian waters, assault Metals, stuffed with Mineral Salt, and loosen their saline Particles, as being of kin, from the mixture; so also the sulphureous Particles, being enkindled, break whatever sulphureous particles are next them, and stir them up into the like motion of Burning, with themselves.

Thus much concerning the Nature and Production of Fire: it remains that we next enquire into the Effects of Fire, and also concerning its Virtue and Efficacy; to wit, what kind of Bodies it dissolves, and by what means; and also what uses it serves for. The chief Effects of Fire are Heat and Might; either of them are excited by Emanations or *Effluvia*, sent from an enkindled Body; but after a far different manner; for truly, Heat is most often produced at a distance, without Light; also Light, without any sensible Heat.

Heat, forasmuch as it belongs to the Sense of the Touch, is conceived, when a certain Passion is induced in the skin, or any other Organ of the Touch, whereby the little Fibres and nervous parts are drawn asunder, moved into light spasms or convulsions, and sometimes (if the stroke be vehement) suffer a solution of the Union. This is wont to be done, either by the bringing near of Fire, or of another Body made hot by Fire, or by some other means: For from either, the sulphureous or warming particles being excited, into a more rapid motion, and breaking forth by heaps, spread abroad, which, as so many little darts, being thrust into our skin, or other Sensory of the Touch, either by tickling gently, they bring to it a pleasing sense of heat, or by striking it more grievously, the troublesome sense of burning or scorching.

For the effect of Heat, Fire is applied to Bodies, either immediatly, and so either for the sake of burning, roasting, or boyling; or mediately, viz. by the interjection of another Body. Bituminous things, Coals, and other things dug out of the Earth, also Vegetables, and chiefly their Leaves, and Woods, are burnt, for heat, necessary for human Uses, and for the producing, and conserving it. Stones are burnt for Lime; Vegetables for the preparing of Salts. The Flesh of Animals is wont to be roasted, and the Fruits of Vegetables; whereby they may become better food for men: For by roasting, the superfluous humidity is evaporated, and the sulphureous parts being stirred by the neighbouring heat, are placed in their vigor and exaltation, by which means, they afford a more grateful food to the Palat, and of better digestion to the Stomack. By Fire Metals are fused or melted, and most Minerals, whereby they are either very much purified, or they are better formed into various figures by Smiths. Metals, and very many Minerals, also Salts, although they are not enflamed, and take a firing (because they abound with less Sulphur, than Salt) yet by a violent fire, they glow, and suffer a fusion; for that the sulphureous particles of the Fire, enter the saline little Bodies, though most compact, and dissociate them for the time; which however pulled one from another, presently the Fire being exhaled, come again together, and are strictly united.

Secondly, When Fire is mediately administred, the particles of the soluted sulphur, and heaped together into fire, are dissociated, as when a Cloud is dispersed into most little drops of Rain; wherefore they lay aside the form of fire; but though dispersed, they easily pass through any impediment, and induce a sufficient strong heat to every Subject. By this means, Fire is accommodated to very many uses, the chief of which, and the more accustomed, are, elixation or boyling, digestion, and distillation.

In Boyling, the Particles of heat do pass into a watery *Menstruum*, and being united with its particles, insinuate themselves deeply into the thing to be boyled: whose superfluous humidities they carry away, digest the crudities, and carry them into a state of maturity. Boyling is instituted, either that the Liquor might be impregnated with the strength of the thing to be boyled, or that the thing to be boyled might be made tender, by the Liquor entering into it, and its Particles exalted: for Meats and all eatable things are rendred more grateful to the Palat by boyling, even as well as by roasting.

Digestion is very much used in Medecines, that their more slow Particles may be carried to a greater activity; and sometimes, that they being too fierce, might be fixed, and rendred more mild.

The most noble use of heat, or of mediat fire, is had in distillations; for the Particles of heat

heat, do pull away some Particles of the subject from others, (as it were by a Spagyric Anatomy) they resolve all Bodies, into their parts and principles. But the consideration of this thing, is too laborious and hard, to be inserted into this Tract.

As heat respects the sensory of the touch, so light that of the sight, and affects it so after a proper and peculiar manner, that nothing at all is discerned, besides the rays of light, direct, or reflected: for the various appearances of Colours, and the divers proportions of Bodies, and whatsoever we see with our Eyes, is only light; to wit, either proceeding directly, or strait from a lucid Body, or retorted from another Body, to the Eye, & so formed into various figures & colours. The consideration of Light, contains in it self, very many stupendious things, and is of deep speculation; which are not however proper for this place: It will suffice to take notice here, of a few things, concerning its Original, Motion, and Perceptibility.

Light is wont to be distinguished, either that it is *Etherial*, which flows from the Sun and Stars; or *Elementary*, which only proceeds from a fired Body, enkindled into a flame. It seems, that either is only flame enkindled in a greater dimension, and dilated into a most thin composition: for it appears to the sense, that from sulphureous things being inflamed; (as for example) from a burning Candle, most thin *Effluvia's*, or most small divided little Bodies perpetually do spring; which being diffused into an Orb, and stretched forth into right Lines, as it were from the centre to the circumference, are still expanded on every side, in a great heap, and fill all the space within the sphere of its activity, with a luminous ray. The Particles of the flame, which first fall away or depart from a lucid Body, are still driven forward by those following behind; and so these also by others; and so by a continued series of Particles of the flames still succeeding, the beams of light are formed, and are thickly or closely directed into all parts.

The motion of these is exceeding swift; like streams of water, breaking forth with a force, they pass through the medium in the twinkling of an Eye, and, as those waters, if the motion be cut off near the Spring, most swiftly vanish. When the Rays of light come directly from a Luminous Body, they constitute a medium, only clear or lucid, without the appearance of any colour or image: when the same Rays meet with a solid Body, they do not pass rightly through it, but being either broken off, they are drowned or lost, or else they are reflected and leap back or rebound, as when a Ball being cast against a Wall, with a continued motion is struck back, upon other parts, according to the Angles of what stopped it. The Rays of light, reflected from other Bodies, being fallen into the Eye, represent the Images of visible things, and the varieties of colours. For as the superficies of visible Bodies are rough, and endued with little pores, and innumerable eminences, or risings up, hence the Rays of light, being most thickly impacted in them, and reflected from every part, according to all the ways of inclinations, and directions, as far as they go, do meet together round about, into very many tops of Cones, in which the beams proceeding from the whole object, as from a base, represent the image or similitude of the whole; and in these kind of images, the medium is every where planted, that wherever the Eye is placed, it beholds the image of the same thing, though not wholly after the same manner. But forasmuch, as the beams of the same light, being impacted in every Body, and variously refracted and distorted, about its rough and unequal superficies, from thence reflected as it were with turnings and windings into the Eye, they cause the diverse Phenomena, or appearances of colours, to appear. For colours, and images of things, do not exist in their own nature, but as it were spectrums, only from another place, change their apparitions by the Rays of light. When dark night brings thick darkness to this inferior World, things are not perceived, but by the Touch, and lose all their appearances: when the Sun revisits the Hemisphere, he brings forth a new Creation of things; and the whole Atmosphere is filled at once, with a sudden and manifold progeny; to wit, with infinite images of Bodies, and appearances of colours.

Therefore Light does not only illustrate the medium, that sight may be made, as some would have it; but it also creates the very objects of sight, and introduces them into the Penetralia or inward parts of the Eye, yea, to the most inward recesses of the Brain. This doth the same Office for the Eye, as the Intellect doth for the Soul, to wit, it forms the *Idea's* or Images of Bodies, and renders them perceptible by the visive faculty. Light only is able to penetrate the Coats and Humors of the Eye, to move the little Fibres of the Optic Nerve, and to stir them up into an act of sensation. Because the Images of things, being forged by the Rays of light, variously reflected, and meeting together on the tops of the Cones, are stayed within the Pupil, or dark spot of the Eye; they seem as objects in a close Chamber, admitted by a small hole, to be represented to the life: and the Concave or Convex Glasses, whereby the parallel beams are broken, or the inverse reduced or brought back, do egregiously supply the humors placed in the Eye, beyond the industry of human Art; by the help of which, the image of every object is painted, near the thin skin of the Eye, in its just figure and proportion: and then, from the motion, which this Image impresses on the little Fibres of the Optic Nerve, the act of sight is performed in the Brain. Thus much for Heat and Light, the Speculation of which, tho' it may seem to be altogether besides the Doctrine of Fermentation, yet forasmuch as by the motion of

these kind of Sulphureous Particles, many other Physical Operations are also performed, a brief mention of them ought not to have been overpass'd in this place. But before we shall lay aside quite the consideration of Fire, it will be here worth our while to inquire concerning some Subjects, as it were irregular, to wit, in which fire shews admirable vertues, and beyond its common manner: of this sort, are among Simples, common Sulphur, and *Sal Nitre*; among Compounds, Gun-Powder, and *Aurum Fulminans*.

Concerning common Sulphur we may observe, that it quickly catches fire, heat it immediately breaks forth into flame, such (as nothing besides) that by its deflagration it puts out the Kitchen-fire, that it sends forth a bluish flame, and whitens all objects with its smoke or soot. If you behold the matter of this Subject, or the parts of which the mixture is composed, its Spagyricall Analysis will exhibit great plenty of pure Sulphur, a moderate quantity of Vitriolic Salt, a little of Spirit, Water and Earth. For when common Sulphur is dissolved, by the Spirit of Turpentine, the Sulphureous part impregnates the *Menstruum*, with a very deep Tincture, and the Saline grows into Crystals: or when it is fired under a Bell; the Sulphur wholly burns, in the mean time the Salt being resolved, and having taken a Flux, is fixed about the sides of the Vessel, and so exhibits a Liquor, most like the Spirit of Vitriol, or rather the very same. To which add, if you mingle the Oyl of Vitriol, and Antimony together; and distill in in a Retort, a Yellow Sulphur, just like the common, will be Sublimed in the neck of the Retort.

I say therefore, because there are very many Particles of Sulphur in this Concrete, and that they lie loose and unbound in the mixture, (to wit, neither divided and separated by the coming between of Earth, or Water, nor much bound together by Salt) therefore they are of a most prompt motion: wherefore by the least spark of fire, they break forth from the loose frame; and because very many run forth adooors together, therefore not a naked fire, as in every combustible thing besides, but first of all and immediately a flame is inkindled. Its flame becomes bluish, because 'tis almost pure Sulphur that burns, not mixed with the Particles of Water and Earth, as it is in Wood or Straw. The very same thing happens to Spirit of Wine being inflamed. It extinguishes the Kitchen fire, by reason of the little Bodies of Vitriolic Salt left behind; and the same being eventilated with the flame and fume of Sulphur, gives a white colour to things; the like to which, the *Effluvia's*, exhaled from the Spirit of Vitriol, or Stygian Waters, do effect.

Concerning *Sal Nitre*, we will take notice, that it is not to be inkindled at all by it self; but to be melted by an intense fire: but being mixed with any Sulphureous things, it breaks forth into a flame, with a certain force and explosion: For being added to common Sulphur, Antimony, or Tartar, it burns with a thundering noise; also if you put into melted Nitre, a burning Cole, or Wood, the flame is exploded round about, with a wind, so that the matter put in is flung up and down here and there, and often times flung clear out of the Vessel: by this kind of deflagration, what is Nitrous is consumed, the fixed Salt (which is Tartar) remains. When Nitre is distilled, Sand or Brick dust, is mixt with it in a double quantity at least; otherwise the Nitre melting is not at all loosened into a vapor. In the distilling the vapor sent forth is very red; so that the Receptacle shines with a splendor, as if a flame were shut up within it: a sharp corrosive Liquor is stilled forth, which dissolves most Metals, also Gold.

These things being truly weighed, it seems that this mixture consists chiefly of abundance of Salt, and a little Sulphur, but these not fixed and idle, but either exalted, and ready for motion, and not without a certain resistance bound together: to wit, the sulphureous little Bodies, being rouled about by the saline, and as it were strictly pressed, still endeavour to get forth; but being strictly bound within, they are not able to rise forth by their own strength, or endeavour: but as soon as, by the mixture and inkindling of another sulphureous Body, the Particles of the Salt are disjoyned, and their Prisons unlocked, presently the included little Bodies of Sulphur, as it were breaking Prison, fling themselves forth with violence, remove every Obstacle, and strike the Air violently with a sudden eruption.

The reason why fire doth not inkindle Nitre, being inclosed in a Vessel, but only melts it, when in the mean time, any sulphureous matter being fired, makes it to flame forth with a noise, is, because the little Bodies, which fall away from the fire, enter the Nitre, make it a little loose, and dissociate the concretion of the Salt, but not so loosen it, that a way may be made for the included Sulphur: but by the addition of sulphureous things, the saline compaction is more dissolved, and is so far unlocked, that the Particles of the inclosed Sulphur fly away all together, and being freed from their straightness, do hugely stretch themselves abroad, and seek greedily an immense space.

That there is plenty of Sulphur in Nitre, besides its deflagration, the Genesis of it sufficiently testifies; for it is begot chiefly in places, where the sulphureous Excrements of Animals abound. The use of it in agriculture argues the same thing, because the fertility of the Earth depends very much upon it: And to this also, the flaming colour, shining in the distilling may persuade.

From these premises, it will not be difficult, to unfold the nature of Gun-Powder, used in Warlike Instruments. For the sudden firing, and vehement explosion of it arise, for that those

very many, and almost infinite Particles of Sulphur, which constitute that fire-dilating Body, being fired, fly away together in a moment; all which breaking forth at once, a force being made, and desiring a most free and ample space, for their expansion, violently move the Air, and all obstacles, and so are exploded, or thrust forth with a noise. There is in this mixture, common Sulphur put, because its Particles are loose, and ready for motion, and therefore apt to move a quick inkindling: there is added Charcoal dust, because in that also, the little sulphureous Bodies (as is seen in Tinder, that is made of half-burnt Linnen) are brought to the very top of eruption; and therefore these presently conceive an inkindling, and both these being fired, and opposed to the Nitre, they quickly loosen its frame, and send forth the sulphureous Particles inclosed in it; which indeed break forth from their impediments with a force, and as the blast of a Bellows, encrease the strength of the whole in firing. The Charcoal dust is added in a moderate quantity; though it abounds with Terrestrial matter, yet by reason of the Sulphur being carried forth in it, it accelerates the deflagration of this mixture: For the Coal and Nitre being beaten together, is sooner fired, and with a greater explosion, than Nitre and Sulphur: but if the Coals be added to this Composition, (as they are wont to make it for Cannon and great Guns) in a greater quantity than it ought, and impropportionate to the Nitre, the immediate firing is somewhat retarded, by reason of the interjection of the Earthy matter; and it happens, that the sulphureous little Bodies therein, apt to be too hastily inkindled, are a little disjoyned; and so the substance of the infused powder, takes fire successively, and by parts, and not all at once.

The reason of *Aurum Fulminans* does not so manifestly appear: but it seems wonderful, that the Calx of a Metal, otherways inviolable by fire, should be brought into a powder, one grain of which, if it be but lightly heated by fire, is exploded with so great a force, and yields such a noise, that is an hundred fold beyond Gun-powder. I know many deduce the cause of this, as in Gun-powder, from a Nitrous-Sulphureous mixture: For they suppose the Nitre drawn forth from the solvent *Menstruum*, to joyn together with the Sulphur of the Metal, and so the powder from thence prepared, to get that fulminating force. But in truth, if this matter be better thought on, it will appear far otherways; because this golden thundring powder, is not at all inkindled, as preparations of Nitre with Sulphur: for if fire be put to it, it goes off only successively, by grains, nor as in Gun-powder, doth the whole fulminate at once; but being put into an Iron, Silver, or other convenient Vessel, and for some time heated, by a sudden fire, at length all the Particles being stirred together into motion, it is exploded with a mighty noise; but yet being exploded, it yields neither flame nor sparks, neither is the Gold lost. For if this powder fulminates in an open Vessel; whatsoever is of Gold, remains after the thundring, in the form of a purple powder; and may be gathered up. That the genuine cause of this may be extricated, there are some things to be observed, concerning its preparations, which will give no small light.

For the making of this powder, it is altogether requisite, that a solution of Gold be made with a *Menstruum*, impregnated with Sal Armoniack, or at least Analogical to it: for I have tryed it in vain with the Spirit of Nitre, Salt, with the Bezoartic Spirit, and some others. Then next it is requisite, that the Calx be precipitated with Oyl of Tartar; for if the same be brought into a powder, with Silver or Mercury being cast in, it loses its thundring force. Also, if the Liquor of the Tartar, be too precipitately poured in, that with the great heat, a repercussion of the thing soluted be made, it often loses its fulminating vertue: but a precipitation being leisurely made, the powder settling in the bottom is washed away, by the often pouring on of warm water, which, though it be most often washed and dried, far exceeds the weight of the dissolved Gold.

According to these positions, it seems most likely, that whilst the Gold is dissolved by an appropriate *Menstruum* for this business, some little Bodies of *Sal Armoniack*, (or some other resembling it) being greatly akin to the Gold, do most strictly cohere with its Particles; which then by the Salt of Tartar leisurely in the precipitating infused, are more fixed, and more strictly tyed fast together: and then the explosion of this powder, or solary Calx, is nothing else than a violent eruption of those kind of Salts, from the Cohesion or Embrace of the Gold. For when the powder prepared after this manner, is brought to the fire, or is otherways made hot, the heat causes the *Sal Armoniack* Particles, or others of the same nature affixed to the solar, to dissociate; which notwithstanding, (when they hardly depart one from another) are not pulled asunder, but by a strong and continued heat: yet afterwards being pulled asunder with a certain force, by reason of the sudden and violent breaking off, they strike the Air impetuously, and so cause a most strong noise, for their bulk. But in the mean time, if the explosion be made under a Silver Spoon, you will see a separation made of either Particles, here the solar of a Purple colour, there the saline of an Ash colour. But that this powder doth not make a noise, unless it be leisurely precipitated with the Oyl of Tartar, it is because some Particles of the Salt of Tartar, being before bound together with the *Sal Armoniack* Particles, do couple together, by which means all are more strongly combined: For the Salt of Tartar being pounded with the mixture of Nitre and Sulphur, fixes their Particles for a time; that this Composition is not pre-

sently inkindled by heat; but afterwards is exploded with a strong noise. And powder prepared after this manner seems to imitate the nature of *Aurum Fulminans*: and it is probable that from other Minerals dissolved and precipitated by reason of the strict Cohesions of the Salt with the Metallick matter, and their violent abruptions, thundering Calxes may be prepared. That truly the preparation of this chiefly depends on the Combination of the Salts, it appears, because, if in the precipitating (as I have known it sometimes to have hapned) the Oyl of Tartar, being too hastily infused, the Complexion of the Salts is dissolved with the Metallic matter, the powder falls in small quantity to the bottom, and of a very Purple colour, whose grains are fragments of almost most pure Gold, and therefore they do not fulminate at all: afterwards in that precipitated Liquor, very many slender Crytals grow together, which are indeed the Salts, having suffered a Divorce from the Metal. Besides, that the Salt of Tartar, brings something to the preparation of this powder, it is a sign, because those things which take away the fulminating force from this, are of the same Nature, which chiefly work upon the Salt of Tartar; as a beating it together with common Sulphur, Spirit of Salt, Oyl of Vitriol, or of Sulphur: for these grow hot, and greedily desire to be joyned with the Salt of Tartar, and so they call it away from the Embraces of the Gold; by which means the Combination of the Salts, with the Particles of the Gold, is loosned, and therefore loses its Gun-like force. What is commonly said, that this powder will be presently inkindled, or exploded, by a most light heat, or by shaking it in an Iron Ladle is nothing true, as appears to me, for I have often tryed it. Nor is it more worthy of belief, what is said, that this only forces downwards, and breaks the thickest hollow Pipes with its force; in the mean time, that it doth not move or shake any thing laid over it, because long since I made tryal after this manner; Two grains of this being laid in a Silver Spoon, I covered with a Doller, then a Candle being held under the Spoon, upon the explosion of the powder, there followed a great noise, and there was a little hollow made in the bottom of the Spoon, almost through, and the piece of mony was carried up with a force to the Cieling, wherefore, when this *Aurum Fulminans* is exploded, its force is diffused round.

Altho' vehement heat, and incited, and also the emission of Smoke and Soot, depends for the most part upon fire; yet sometimes we perceive it to be produced in some subjects, and that in a very high degree, without its being actually inkindled. A most known instance of which thing is, quick Lime sprinkled with water: which also Stygean waters shew, being mingled with Iron, the Butter of Antimony, and with the Salts of the stigma of Vegetables. The learned men, *Gunter*, *Conringius*, *Hogelandus*, and almost all that have touched on the Doctrine of Fermentation, have delivered the effects of this Nature, as especial examples of Fermentations, wherefore it will be worth our labour, to inquire something concerning each of them: but on this condition (which I also have observed in other disquisitions) that I willingly let alone the opinion of others; for a Traveller had rather drink at the Fountains themselves: I will then as briefly and succinctly as I can dispatch the business.

Quick Lime is made of the Lime Stone, also of many others (excepting only such which consist of a reddish, and as it were sandy grain) being Calcined in a close Furnace for many days, with a reverberating fire: by this means, the frame of the mixture is loosned, that it goes into a friable matter, or that may be crumbled, which by reason of the high astriction or binding nature, in which it excels, serves most excellently for the making of Cements for Walls: This Calx or Lime being taken from the Furnace, retains still the form of stone, and seems cold to the touch, but water being poured thereon, it swells up, and grows wonderfully hot, sending forth smoak, that it burns all Bodies that are put into it, besides it falls of it self into a white dust: To which Particles this motion and heat ought to be ascribed, viz. whether to those implanted in the Lime-stone, or to the others acquired by the fire, doth not easily appear: but that we may loose this knot, if we can, I have instituted this Analysis of quick Lime. I put about half a pound of it into a large Cucurbit, then water being poured thereon, I fitted the little Head with a capacious Receiver; by and by, within five minutes of an hour, the matter began to swell, and to grow very hot; then a smoak, and a breath being raised, all the Vessels became so hot, that I could scarce touch them with my hands. A clear water distilled forth into the Receiver, about six Ounces, which was not sharp, but of a Styptic or Astringent sweetish taste; the remaining powder in the Cucurbit, I boiled with common water, and the Lye thereof made, I endeavoured to boil away with a gentle fire; while it did evaporate, there gathered together on the superficies of the Liquor, a white and crusty little skin, also of a sweetish taste, and the same being taken away, presently a new one succeeded; the humor being at last wholly exhaled, there remained in the bottom nothing that was sharp or salt.

We may collect from this, that this heat doth not proceed from the implanted Principles of the Lime-stone, viz. either saline or sulphureous however moved within themselves: for only a Sweetish Salt was to be found in it, which was also Volatile; and it is a sign that there is not much Sulphur in the Lime-stone, because by a long Calcination, the form of the mixture is not quite destroyed, nor its substance wholly broken: wherefore, it is very likely, that whilst these stones are burnt in the Furnace, some Particles of fire do strictly cleave to the saline, and so reside

in that mixture, as it were strangers; which whilst they lie asleep, and continue idle, and being separated one from another, by the coming between of Earth, although they are very many, do not raise up heat; For all heat depends upon motion: but when water is poured to it, those fiery Particles, being thrust out of their Cells, flow together, and fly away by heaps from that Inn; so breaking forth by Troops, they cause a very intense heat, and because diluted with water, only a smok, and not an actual fire.

It is a sign that little Bodies of fire, or fiery Particles, do stick a long while in matters Calcin'd, because Iron Instruments, according as those Particles are driven forth of their pores, more or less, leisurely or by heaps, become soft or hard; tough or brittle: moreover, it is observed, that Bricks, or fresh Earthen Vessels, being dipped in water, cause a certain hissing; also Tobacco Pipes, if one end be put into water, and the other brought near to the Ear, yield a certain sharp noise and rumbling: add to these, that fixed Salts being calcined, or having suffered a flux by the fire, become far sharper; also Stygian waters, by reason of those kind of little Bodies involved therein, which afterwards leisurely evaporate, perpetually send forth sharp fumes: and when these are poured upon saline Calxes, not only an Ebullition is raised, by reason of the disagreeing Particles of the Salts, which strike one another mutually, whereby they might be more strictly combined; but besides, heat and smok succeed, which for the most part arise from the fiery Particles being shuck out of their Dens. But it is not easie to give a reason why quick Lime, and no other Concretes, retain so copiously those kind of fiery Particles, and yield a strong heat, water being poured on them.

'Tis plain enough, that when the sulphureous Effluvioms of fire, (forasmuch as they are most penetrating) enter all Bodies whatsoever, brought near, affect them after divers manners: those which are more lax, and stuffed with active Principles, are destroyed wholly by burning, and because their substance decays, the fiery Particles, as Soldiers in a City spoiled by themselves, do not continue long in the ruined place, but go farther, and move their Tents: but where the Concretion of the Subject is very compact, and that its Elements cannot be so pulled in pieces by the fire, that they rather grow stiff, as is seen in Metals, Glasse, Bricks, and other things made hard, either by boiling, or fusion; the fiery Particles entred in, being received in an incommodious Inn, presently go forth again; and therefore few are wont to stay in mixt things of this kind, or in things fused, or calcined: but if fire be so applied to the more hard Concretes, of which sort are most stones, and shelly Concretes, that the bond of the mixture be unlocked, some parts, viz. the watery and sulphureous are driven away, and so some spaces are made hollow, very fit for the receiving any stranger; in the mean time, that the frame of the matter be not wholly destroyed, but that it may continue its compacted and stony form, which flows not away together with its Particles, and ever threatens its ruin; in such a Subject, chiefly the Particles of fire, possessing the spaces of the parts flown away, copiously remain; and there cleaving close to the saline little Bodies, being detained one from another, by the coming between of the earthy, lie quiet; which notwithstanding afterwards, being violently driven from those Inns, are able to produce by their eruption, an intense, and almost fiery heat: in the mean time those saline little Bodies, are so loosened, by the long familiarity of the fiery, and by the embrace of one another, and of the strangers, that they become Volatile, and being diluted with Water, for the greatest part evaporate with it; and the remaining Salt, because also Volatile, and having suffered almost a divorce from all the rest of the Principles, is both sweetish, and becomes desirous of conjunction, and astringent; and therefore also is of excellent use for plastring of Walls.

But that Stygian Waters, being poured upon the Stagma's of fixed Salts, produce heat, and the same mixed with Iron, or the Butter of Antimony, stir up a mighty ardour, with a blackning smok, the reason seems plain. As to the Stygian Waters, and fixed Salts, it may be said that both these Concretes are only Salts, having got divers states by the fire, and so either being very much stuffed with fiery Particles (which are the most minute atoms of Sulphur:) But they being confused together, do forthwith rush into mutual Embraces, and because the Particles of either, are made unlike, therefore, whereby they may be more strictly united, there is made a great attrition of parts, and together an excussion of the fiery Particles, from whence the great ebullition, with a heat is excited: when the same *Menstrua*, are poured on Iron, or the Ice of Antimo, the Salts of either come together, and shake forth the fiery Particles, and also the sulphureous Particles, before implanted in either Subject; which flying away in heaps, cause a smok with a heat, but not a flame.

C H A P. XI.

*Of the Motion of Fermentation, as it is to be observed, in the
Precipitation of Bodies.*

WE have hitherto treated of the Solutions of Bodies; it remains now, that we speak of Precipitation: This is performed only in Liquids, which, when as they are stuffed with Heterogeneous Particles, are compelled by a matter Precipitating those Particles, to separate one from another, and to obtain for their substance, divers places and conditions: wherefore, since in this operation, there is an agitation and motion of parts, its consideration ought to be referred to the Doctrine of Fermentation.

Precipitation is performed, either in Natural things, as chiefly in Milk, Blood, Urin, and perhaps in some others; or in Artificial things, which are of a divers kind and nature: but they may be described and ranked in a certain order, according as the Liquor to be Precipitated, or Precipitating, is either Spirituous, Sulphureous, Watery, or Saline: besides, according as the Particles separated from the rest, are either Elementary, (*viz.* either Sulphureous, Earthy, or Saline) or Integral, which participate of the nature of the whole mixture, and are only very small portions of it very much broken.

There are two common and known ways of Precipitation, whereby is made from Milk, both Cheese, and Butter: As to the first, if any sharp thing be poured into warm Milk, the thicker and Cheesie parts, presently separate from the serous and thinner, and are gathered together into a thick substance. The reason of which consists in this: Milk has a somewhat thick consistence, and its pores and passages are very much beset, with the thicker (to wit, the Cheesie) contents; wherefore when something more subtil and penetrating, (as is Rennet) passes through the Liquor, it easily thrusts forth the more thick Particles, with which the pores were possessed; which then mutually Embrace one another, and are separated apart from the thin, and Wheyie Liquor. When Milk is kept long to a sourness, it is Precipitated after the same manner, without Rennet, by warming it over the fire. For in stale Milk its Saline parts get a Flux, then being stirred up by the fire, supply by their own sourness the turn of Rennet; yea, it is not improbable, that the fluid Salt in the Rennet provokes the Saline Particles of the Milk, into a Flux, and that for this reason chiefly its Coagulation succeeds: for that the Saline parts having gotten of their own accord a Flux, so bind the pores of the Liquor, that the more thick Contents are willingly exterminated from them: wherefore we do say, for that reason, the same thing happens, when a Flux of the same Salt is caused by some thing else put into it. But that the Coagulation of Milk happens, not only by reason of the passages and pores being possessed by a strange Body, the sign is; because the Salt of Tartar, tho' exceeding Precipitatory, effects nothing of this, and this effect is excited almost only by four things. Sugar hinders the Precipitation of Milk, and many other Liquors, because it restrains the Flux of the Acetous Salt; and as it is easily soluble, and its Particles are soft and blunt, they extrude not the former Contents implanted in the Liquor, but fill all vacuities, that afterwards there is no space whereby another Precipitating Liquor may unfold it self, and break into anothers quarters.

But Country People are wont to make Butter of the Flowers or Cream of Milk, kept for the most part to a sourness, only by shaking or Churning it. The reason of which (as it seems to me) is this: In Cream there is great plenty of Sulphur, with which also a mean portion of Salt and Earth is mixed, as may be conjectured, both by the sourness of the Liquor remaining of the Butter, or the Butter-Milk, and by its thicker consistency. In this mixture, the parts both Saline and Sulphureous are in motion, and a flux: but as the Liquor is thicker they cannot presently fly away: wherefore it remains, that if the bond of the mixture be further loosened, they will separate into parts, and that first the sulphureous Particles, which exceed the others in power, are congregated together with a mutual embrace; wherefore these two things, the Churning of the Cream performs, *viz.* it brings the sulphureous parts by their often obvolution together, whereby they do the better intangle themselves, and mutually ensnare one another; besides, it breaks their mixture with the rest. For this reason, in the Winter time, (when Cream is thinner, and abounds less with Sulphur) Butter is hardly made. Besides, the admixtion of Salt or Sugar wholly hinders its making; because by the coming between of those little Bodies, the Sulphureous parts are hindred, from a mutual adhesion.

The chief Precipitation of the Blood, which is performed within a living Body, is made in the Reins; where, not without the strength of a certain Coagulum, or Rennet, the serous matter is separated from the rest of the Blood; just as Whey from Milk: For which reason Diuretical things are of the same nature, as those which bring a Coagulation to Milk; and therefore, because they more Precipitate the Blood by fusing it, they cause a large profusion of Urin. The Blood being sent forth of the Vessels, separates into various substances, by its own disposition: whilst it is warm, it is variously Precipitated, by some Liquors poured to it, (in like manner Urin) not without a pleasant spectacle. If you pour upon warm Blood the Spirit of Wine, Harts Horn, Soot, Vitriol, or other Liquors, chiefly Spirituous or Saline, a wonderful Ebullition, and heat is stirred up; whence we may conjecture, after what manner it grows turgid, in Fevers. But before the rest, the Salt of Tartar, and a Solution of Alum, procure both in Blood and in Urin, a great perturbation of the Liquor, and falling down of the parts: for these disturb all the Contents in the pores and passages of the Liquor, and by their astringency, very much lock them up for a long time.

Precipitation in Artificial things is of greater note and use: for this for the most part follows Dissolutions, and succeeds them as it were by a certain right of Order; because this takes out of their Jaws, and, as it were, lays by the prey, which all *Menstrua* take by dissolving. According to the diversity of the *Menstruum*, and of the Body dissolved, Precipitation also variously happens: but in some Subjects there are two chief remarkable things, concerning the manner of Precipitation; to wit, the soluted Particles, immersed in the pores and passages of the *Menstruum*, are wont to fall out of them; either by reason of the narrowness of the containing space, or else by reason of the Contents being increased in weight and bigness: for in some the pores of the Solvent, being either leisurely bound up, or beset with a strange Body, shut forth from their Cells, the little Bodies of the thing soluted, and send them to the bottom; as may be observed in Sulphureous Solutions, or such as are made of the whole mixture of integral parts, in a thin Liquor; which are disturbed, and lay away their Contents by external cold, simple water, or at least by any Acid infusion. After this manner, resinous Tinctures, also of Sulphur, Olibanum, Benzoin, and the Infusions and Decoctions of Vegetables, also Urin, Milk, and Blood, are wont to be Precipitated: but in several others, besides that the pores, and passages of the *Menstruum*, are either leisurely drawn together, or possessed by a new guest, also something new grows to the Particles of the thing soluted from the Precipitating matter, whereby being increased in weight and bulk, they can be no longer sustained; but that they are necessitated to sink to the bottom. This is chiefly seen in the Saline Solutions of Minerals, which are only Precipitated by the Salts; whose Particles presently cleave to the little Bodies of the thing soluted, and increase their substance, that presently they descend to the bottom by their own weight: For in Saline Solutions, the little Bodies of the thing soluted, are strictly bound together by the fluid *Menstruum*, with the Saline Particles; and the Particles run hastily and are heaped together into the Embraces of the same fluid Salt, from the Precipitating infusion of the fixed Salt: wherefore, when these three, (to wit, the little Bodies of either Salt, and of the soluted matter) do cohere together, they constitute greater grains than can be contained in the narrow spaces of the *Menstruum*, and therefore being thrust out, they fall down towards the bottom: That this does truly happen after this manner, the great affinity, both of the fluid and fixed Salt, is a sign; that the Particles of both being placed near, or mixed together, are presently combined in one: also, because many Solutions of Minerals, are presently Precipitated by a fixed Salt; but not by Vitriol or Alum being put in, which do much more bind, and stop up the pores of the Liquor. Thirdly, It appears clearly even to sense, because that the matter put for a Precipitate, far exceeds the thing soluted in bulk and weight, and is impregnated by the fixed Salt adhering to it. But these being thus disposed, we will descend to the particular cases of Precipitations, forasmuch as Precipitation is made manifold; to wit, according to the diversity of the *Menstruum*, of the soluted matter, and the Precipitating infusion.

Simple Water, though it do not well sustain the Particles of the mixture which it receives into it self by Infusion, or Cohesion, yet hardly sends them away by Precipitation. For the pores of this *Menstruum* are too open and loose, wherefore the Precipitating matter, doth not easily strike the little Bodies of the thing soluted: in the mean time, by reason of the more loose frame of the *Menstruum*, some parts of the soluted Body sink down; others of their own accord evaporate, from whence that Liquor doth not long keep the Vertues or Tincture, with which they are impregnated by another. As some more thick parts and Terrestrial may be thrust down to the bottom, or otherways separated, we put in the Juice of Limons, or some acid thing, or boil in it the whites of Eggs, to wit, that whatsoever is thick might cleave to their viscous substance.

Spirituous and Sulphureous *Menstrua*, being impregnated with the Sulphureous Particles of the thing soluted, easily lay by their burden; for they are Precipitated by common, or any distilled

distilled Water; as is seen in Sulphureous and Resinous Tinctures of Sulphur, Scammony, Benzoin, Frankincense, and others of that kind, prepared by the Spirit of Wine, or Oyl of Turpentine, which presently grow Milky, by Water or Phlegm being infused. For in these sort of Solutions, the pores are wholly possessed, that they admit nothing besides the thing soluted; and besides, both the Liquor, and soluted Matter are so thin, that they easily give place to any thing else being infused.

When *Menstrua's* of this kind are filled with Saline Particles, as we may observe in the Tinctures of the Salt of Corals, of Tartar, and such, Precipitation does not presently succeed from Common Water, but from an Acid Liquor, as the Spirit of Vitriol, Salt, &c.

Saline *Menstrua's* impregnated by the Solutions of Stones or Metals, are most easily Precipitated by Saline Particles, and scarce by others. The chief Precipitatory Liquor, is the Salt of Tartar, or of Herbs burnt to Ashes, deliquated or melted; for this strikes back the Particles of every soluted thing whatsoever, and sends them headlong to the bottom; to wit, forasmuch, as it passes through every where, the little spaces of the solvent, and sticking to the Contents, increases them in bulk, that they more easily fall out of the pores of the *Menstruum*, bound also together with their own weight.

What fluid Salt (as Vinegar, Stygian Waters, &c.) dissolves, the same a fixed Salt precipitates; and on the contrary: because Salt of Tartar being melted, most excellently penetrates common Sulphur, and receives the Tincture; which then is precipitated by a fluid Salt, viz. by the Spirit of Vitriol, and the like: which indeed does not happen, by reason of the disagreeing Particles of the Salts, and mutually opposing one another; but for that the same are greatly of kin, and rush into mutual Embraces: for from hence, the little grains of the thing soluted, by reason of the cohering of both the Salts together, being increased in bulk and weight, are more readily thrust out of the little spaces of the *Menstruum*, and descend to the bottom. We will in this place, more sparingly insist upon instances of this nature, because the more full handling of them belongs to the Chymical Work.

Precipitation is not only observed in the separation of a more thick matter, from a ferous *latex*, and in the settling of the disturbed parts towards the bottom; but sometimes the Particles shut up within the pores and passages of the Liquor, are so small and subtil, that being Precipitated, they are not discerned by the sight, neither do they quickly descend to the bottom; but from their situation and position, being variously changed, the colour, and consistency of the Liquor, are diversly altered. I was wont in times past, to sport with the Solutions of Vegetables and Minerals, which being made by themselves, were clear, like Spring Water, and appeared bright, being commixed, shewed now a Black colour, now a Milky, Red, Green, Blue, or some other kind. The Solution of Saturn, (or Lead) being made with distilled Vinegar, appears bright like common Water, if you add to this Oyl of Tartar, like clear Water, the mixture straight grows White, like Milk. If Antimony calcined with Nitre, be boiled in Spring Water, the straining seems clear, and almost without smell, which yet being dashed by any Acid thing, presently acquires a deep yellow colour, with a most wicked stink. Common Water being imbued by an infusion of Mercury sublimate, is presently tinged with yellowness, by Oyl of Tartar dropped into it. Quicksilver, and *Sal Armoniack*, being beaten together, and sublimated in a Matrace, by the heat of Sand, go into a white powder; this being soluted by melting, shows like to clear Spring Water, which yet being smeared upon Brass, or Copper, appears like Silver; and being lightly rubbed on brasen Vessels, renders them as if they were perfectly silvered. A Solution of Calcined Tin, being put to melted Salt of Tartar, becomes bluish. A clear infusion of Galls, being mixt with a solution of Vitriol, makes Ink; if you add to this, Spirit of Vitriol, or Stygian Water, the black Liquor is by and by made clear, like Spring Water; and this Oyl of Tartar reduces again to Ink. And what is more wonderful, if you write on Paper with the clear infusion of Vitriol, and frame any Letters; what you so write presently vanishes, nor is there any marks of the Characters left: but if you smear over the Paper with an infusion of Galls, presently the Letters may be read, if wrote with Ink; which yet, with a Pen run over, dipt in Spirit of Vitriol, you may put quite out at once wetting, and then again render them, with wetting them with another Liquor of Tartar. The Sky-colour Tincture of Violets, being dashed with Oyl of Vitriol, becomes of a Purple colour: to which, if you add some drops of the Spirit of Harts Horn, that Purple colour is changed into Green. *Brasil Wood*, being infused in common Water, leaves a very pleasant Tincture, like to Claret Wine; if you pour to this a little distilled Vinegar, the Liquor appears clear, like White Wine: a few drops of Oyl of Tartar reduces it to a deep Purple colour: then if the Spirit of Vitriol be poured in, it becomes of a pale yellow, like to Sack; if you add the Salt of Lead, being soluted by deliquation, the mixture grows presently Milky: by this means you may imitate that famous Water-drinker, who having swallowed down a great deal of Spring Water, was wont to vomit forth into Glaces placed before him, diversly coloured Liquors, resembling the

the *Idea's* of divers kinds of Wines: for Glasses being medicated with the aforesaid Tinctures, (so lightly that they may not be perceived by the standers by) will not only cause the Water poured into them, to imitate every Wine, but will exhibit the very *Proteus* himself of the Poets, changed into Waters, and from thence putting on all colours, and infinite forms.

If a Reason of these kind of appearances be asked, it ought to be sought in the minute Particles, contained within the pores of every Liquor; which as to their site and position, being diversly altered, by another Liquor infused, transmit variously the Rays of Light, many ways break or reflect them, and so make divers appearances of colours. For when the Rays of Light pass through almost in right Lines, they make a clear colour, like Spring-water; but if in their passage, they be a little broken, the Liquor grows yellowish; but being more refracted, they cause a red colour; if they are bowed back, so as to be drained, or that they cannot shew themselves, a dark or black colour arises; but if they are again reflected, to the outmost Superficies of the Liquor, they create the image of Whiteness: after this manner we might variously Philosophise about other colours, and their appearances, the diversity of which, and sudden alterations in Liquids, depend chiefly on Precipitation: because, as the Particles contained in the Liquor, are driven sometimes more near by another infusion that they clasp themselves together; sometimes are ordered into other series of positions, the diverse representation of colours is made. For Liquor being impregnated with little Bodies or Atoms, or this Nature, most minutely broken, seems as an Army of Soldiers placed in their Ranks, who now draw into close Order, now open their Files and Ranks, now turn to the left, now to the right hand, as is diversly shown in the exercising of Tactics, or the Art Military. When two clear Liquors being mixed together shall make Ink, it is because the Particles contained in either, approach near one another, and as it were placed in their close Orders hinder the passage of the beams of light: when afterwards, this Ink is made clear by another Liquor poured in, it is because the new Bodies of the thing put in, disperse abroad the former close joyned Particles, and drive them as it were into their open Orders.

CHAP. XII.

Of the Motion of Fermentation, as much as it is to be observed in the Coagulation, and the Congelation of Bodies.

Coagulation and Congelation of Natural Bodies, no less than their Solution, depend only on these our Principles. The impropportionate mixture of these, and the exaltation, and powerfulness of some above others, are the cause of either. Spirit and Sulphur being loosened from the bond, do not only pull asunder the proper Subjects, but they set upon whatever is next them; and where they are mighty in number and strength, they affect nothing more than divorces and separations from the rest of the Principles, and suffer no delay: but on the contrary, Salts love to be united to the rest, and to be made into hard and solid substances; and being destitute of the Company of the rest, presently to enter into new Friendships, and desire only not to be joyned to any opposite. If at any time they are more impetuously moved, either by their own disposition, or being soluted, they destroy the substance of others, this thing seems to be done for this end, destined as it were by Nature, that they might find out subjects agreeable to themselves, and having through War obtained Peace, they might at length be more strictly united unto them: wherefore when saline *Mensfrums* corrode Stones or Metals, they are Coagulated with their Particles, and grow together into diversly figured Crystals.

When we here treat of Coagulation, we do not take this word after the usual manner: to wit, as it is wont to be vulgarly usurped, when Milk is become congealed, that is, departs from its simple and equal Liquor, into Heterogeneous substances, *viz.* Cheese, or Curds and Whey, or thick and then; in like manner, when Blood or other Humors go into parts after that manner, they are said to be coagulated: also, we have elsewhere given this sense, to this word, tho' to speak properly, these sort of motions ought rather to be referred to Precipitation than to Coagulation. But here we would have to be understood, by the term Coagulation, an alteration in Bodies of the same kind, as when things at first tender and soft, grow hard, into a stiff, and as it were stony matter: or any thing is said to coagulate, when saline little Bodies being dispersed abroad in any subject, begin to be congregated and joyned

together, and from thence united, either among themselves, or with Earth, produce out of a soft and fluid substance, a hard and compacted. This may be perceived in the shells clearly stony, of Fruits and Seed; in Bones and Horns of living Creatures, in shells and shelly scurffs of Fishes; all which indeed very much abound with an Alkali Salt, or the same Volatilized. Among Handicrafts, or Preparations from Human Industry, the Crysalisation, Vitrification of Salts, or making of Glass, also the baking of Pots and Earthen Ware, ought to be referred to Coagulation.

But it is properly called Congelation, when the Saline Particles, coming from elsewhere, strictly bind together the subjects on which they fall, fix the Particles variously moved within the substance of the mixture, and gather them together, that by that means the whole becomes stiff, and as it were stony. We may behold these kind of effects in Ice and Frost, by which soft Mud, or fluid Springs of Waters grow stiff, into a very Marble substance. Also the same is manifestly beheld, among the Operations of Art, in the confusions of some Salts, and mutual Concretion in Sublimating; by which means, they go into a substance, now like to Ice, now to Snow. To which may be added the Artificial turning of Water to Ice, which is performed by the mixture of Salt and Snow; but the instances which we have remarked in either of these, about the Works of Art, we will in this place briefly run through, and a little consider the reasons of them, and the ways of being done.

The Crysalisation of Salts, is procured after this manner; Salts of every kind are thoroughly dissolved in common Water, and their Particles being dispersed through the whole Mass of the Liquor, wholly disappear; afterwards, if this Liquor be somewhat evaporated, that its passages and pores be something bound together, the little Bodies of the Salt close one with another, and mutually take hold of themselves, and joyn together, the outward cold binding them, and are figured in the midst of the Water, into Crystals proper to their Nature. By this means *Sal Nitre* into Pyramids, Sea Salt into Cubes, Alum into eight cornered Figures, *Sal Armoniack* into six cornered; and other Salts are formed into other Figures of their own accord, after a constant manner.

If the Reason of this be sought after, we say that these kind of Salts are not simple Elements, but Bodies made up of abundance of Salt, with the other Elements mixed with them in small quantity; which even as other Natural Concretes, are allotted by the first Creator, peculiar manners of figurations, according to the surpassing strength of Salt and Spirit, and commixion with the rest. For in determining the Figures of Natural Bodies, Spirit and Salt are as the Rule and Compass in describing Mathematical Figures: Spirit, as the moveable Foot of the Compass, or as a Pensil in the hand of an Artist, variously excurs and draws here and there diverse fashioned lineaments. But Salt (as the applied Rule) moderates the excursions of the other, and determinates them, and restrains them within the confines designed by Nature: when the Spirit is more powerful than the Salt, there happens a greater variety in the Figuration of things, as in Vegetables and Animals; because the Spirit running forth more largely, forms very many Marks of its Pourtraicture, and describes Bodies not in right Lines, but intorted, and very much variegated. Where the Salt lords it over the Spirit, as in Mineral Concretes, and chiefly saline; Bodies grow together in less adorned Figures, and are accounted the first and more simple, and of that sort, as the Mathematical descriptions in right Lines or Circles. For those Salts, are as it were second Elements; and from the implanting of them in Bodies, the proper and native Figures of things, very much depend; and therefore they themselves are primitively imbued by Nature with a certain Elementary Configuration, (so that according to *Plato*, God in truth exercises Geometry) and the first regular Figures are formed in the more simple, that things compounded of them, might arise furnished with all manner of variety of figures.

The fixed Salts of Herbs being prepared by Calcination, because they are almost destitute of the Fellowship of Spirits, do scarce go at all into Crystals, nor are they coagulated, but by a long evaporation. Sea Salt containing a very little Spirit, with great Labour goes into Cubes. Next to this Alum, gifted with a little more Spirit, is more easily coagulated, and grows into more elaborate Figures, *viz.* eight cornered. *Sal Nitre*, swelling with spirit, is most easily coagulated, and is framed into a more perfect Figure, *viz.* Pyramidical; which consists of both spherical, and right Lines. But Volatile Salt, (such as is distilled out of Urine, Blood, and the Horns of living Creatures) being associated with a plentiful Spirit, is drawn into Concretes, very much varying, which imitate now the Horns of Staggs, now the Figures of Plants. Out of Mercury, with Salt, or the Calx of Silver, by an Amalgama, in the midst of the waters a Silver Tree is formed, with Stock, Trunk and Branches, painted to the Life. It is a usual thing in the Winter-time, for the Air, impregnated with saline Vapors, and fallen on the Glass Windows, to be condensed into most fair Figures of Trees and Woods. So much for the Crysalisation of Salts: The other Species of Coagulation, is Vitrification, of which we will speak next.

Vitrification (which is also said to be the last mutation of Bodies, of which Nature is capable, and from which there is no going back) depends upon a fused Salt, and united to an Earthy Matter, even to its smallest Particle: for when either Matter is fused, by a most vehement fire, and divided in its smallest parts, the Bodies of either, being put into a Flux, are by so strict a marriage joyned together, that afterwards they are never to be pulled asunder.

There are many ways, and diverse provisions of Vitrification; to wit, of *Sal Alkali*, with Sand or a sandy matter fused together by a violent Fire, common Glass is made; which is transparent, both by reason of the abundance of Salt, and of the clearness of the Sand; for if you behold the little Sands of which Glass is made, with a Microscope, each of their little Globes appear, (as they were Glassie Gems) clear and shining. Wherefore Salt promotes the fusion of that clear matter by fire, and then is admitted into its most strict embraces being fused.

Besides Glasses of diverse Colours and Consistences are made of Minium, the Calx of Tinn, Antimony, and some other Minerals, (when the sulphureous part doth first fly away) fused, now by themselves, now with Flint or Sandy matter. The reason of all which consists in this; that Salt and Earth, being most finely broken by a violent fusion of fire, and being divided as to their last Particles, catch hold of one another, and so are bound together, by the most strict bond of the mixture. The Coalition or Coupling of these, is never to be dissolved, because there is wanting within in the mixture, other Principles, which might unlock the frame of the subject: yea, Salt and Earth, being joyned by the mediating fire, do so intimately cohere, that they affect not divorces of themselves, nor suffer them from another.

The baking of Earthen Pots and Bricks, is of kin to Vitrification (or making of Glass) whereby moist and soft Clay is stified into a very stony hardness: But in these, there is greater plenty of Earth, and less of Salt; wherefore they are less brittle, and not transparent. Concerning these we say, that by the fire mediating, and as it were handying the smallest, broken, and divided Particles of Salt, are married to every Particle of the Earthy matter, and with them grow hard, into as it were a stony substance, and that not easily to be resolved. Also in these kind of matters, prepared by human Industry, we imitate indeed, with an excellent Artifice, the Concretions of Bones and Stones, made by Nature in divers Families of Animals, Vegetables, and Minerals.

As to what respects Congelation; Salts of a diverse kind, do often meet together, and grow stiff, into as it were a new substance: But this happens many ways. Of these, some Salts being mixed together, presently grow together into Crystals: for the Acid Spirits of Minerals being added to the Salts of Tartar, or those made of the incineration of Vegetables, turn into a white Coagulum, like Snow, and with a spumeous or frothy Heat: The reason of which is, that the Particles of the Salt, having gotten a Flux, take hold of other Salts in the Spirit, Alcalifate by melting; but by reason of the first Particles of either, being made unlike, there arises a strife; then from the same consociate in one, that white settlement is made.

Not unlike the same manner, these Acetous Spirits, to wit, of Vitriol, Nitre, Salt, and others being mixed with Metals, while they corrode them, are Crystallised together with their saline Particles: so the Spirits of Vitriol, Nitre, also Stygian Waters, (which are only Salts having gotten a Flux) are formed into most elegant Crystals, in the dissolving of Silver, Iron, Copper, and other things. For Salts, even as Sulphur, being loosened from the mixture, dissolve other mixtures, and greedily desire to be united with the Homogeneous Particles of the same subject.

There is another manner of Congelation, when Salts being mixed with some other matter, are elevated by sublimation out of their subjects, and then congeal the Particles of that new matter, which they carry away with them, and grow together with them (like a Meteor) on high: after this manner the Salts of Vitriol, Nitre, and Sea Salt, being sublimated with Mercury, are congealed as it were into a snowy substance: The same being sublimed with Antimony, go into a matter like Ice. After this manner the Natural Congelations, by which some Minerals, and chiefly Vitriols and Sulphurs, are begot in the Bowels of the Earth, may be imitated. For of Iron and Copper are prepared facitious Vitriols, which are very like the Natural: Of Antimony Sulphur is made, which answers to an hair our common Sulphur in taking fire, colour and smell: For example, Pour Oyl of Vitriol, to the height of a finger's breadth, upon pulverised Antimony; and let it be distilled in a Retort in a Sand Furnace, a yellow Sulphur will be sublimed in the Neck of the Retort, that cannot be discerned from the common Sulphur: which is a sign that the Concretion of Sulphur is made in the Earth, when some sulphureous Mineral is corroded by the Salt of Vitriol, whose sulphureous parts are congealed by the same Salt. This also is an Argument, that Oyl of Sulphur, which is separated, by inkindling under a Bell from the sulphureous matter, is nothing else but Vitriolic Salt, nor doth any thing differ from Oyl of Vitriol.

Artificial Congelation concludes Instances and Examples of Congelations : to wit, whereby common Water, or any Liquors being put over the fire, or in an Hot House, are suddenly congealed into Ice : 'tis a common way, and vulgarly known. Salt being mixed with Snow and Ice, and agitated or shaken in a Vessel put into Water, suddenly the Water about the sides of the Vessel will be frozen. This will be done, if you make tryal of it, either with common Salt, or Sea-Salt, Nitre, or also with Vitriol, Alum, *Sal Armoniac*, or Mercury sublimate: For Salt of every kind, being put to Snow or Ice, loosens their mixtures, and sends away the Nitrous and Congelative Particles from the subjects ; which presently being immersed in the neighbouring Water, congeal it, as if they were freshly blown from the North.

What is more admirable ; let a Dish with Snow be placed over hot Coals, and in the middle of the Snow put a Glass full of Water : as the Snow is melted by degrees by the fire, the Water shall be frozen : for the Nitrous Particles, being driven away by the heat, by their departure, they are dashed against the neighbouring Water, and congeal it.

And thus much for FERMENTATION in general, and briefly of its various parts ; it had been almost an infinite Labour, and from our purpose, to heap up Instances in so diffuse a thing. Those hitherto brought, however chosen out of Natural Philosophy, were fit to wait upon the following Medical Dissertation, that we may more happily know the Original, Progress, and State, as also the Remedies and Cure of Motions, and Mutations, in Causes, which variously happen to all kind of Bodies, and somewhat respecting the Tumults, which from thence are begot in the human Body, from the Blood being irritated, and the rest of the humors ; to which exercise, God willing, we will now proceed.

F I N I S.

THE P R E F A C E TO THE Treatise of Feavers.

To the Friendly Reader,

TO Institute in this Age a new Doctrine of Feavers, may perhaps seem the same thing, as if any one should go about to describe the midst of our Country, for a Land before unknown. For what respect the Diagnosis of this Disease, seem to be firmly Established already, by the Precepts and Practice of the Antients and Moderns; yea, by long Experience, they are so generally in the mouth, and known of all Men, that nothing can be more. However I deserve pardon, if I a little receed from the Vulgar Opinion concerning Feavers, as a way mightily worn out; and go on in a lest trodden Path; because I am not the first, or only Man that directs his course against the received Opinion, as against a Stream. For in truth, in the Medical Art, (and that deservedly) those things have not pleased the Men of our Age, which did those of the former: because the Antients relying on a false Position concerning the Motion of the Blood, proceeding as it were through slippery and moist places, often fell foully and dangerously: wherefore it is no wonder, if those who come after should take care for the thorough Instauration of Physick, and for the Re-Edifying the Building, (as they say) even from the Ground, the Antient Props being fallen down, on that which our most Famous Harvey hath laid, the Circulation of the Blood, as a New Foundation in Medicine. But in this Work, Learned Men of other Countrys, but chiefly of our own, have happily laboured, not only in removing the Rubbish of the former Building, but for the supplying this plentifully with Stone, Planks, and other Matter. In times past, among the Antients, as the Distribution and Natural Motion, of the Nutritious Humor, of the Blood and Nervous Juice; so the Feaverish Heats, and Preternatural Motions of them, were wholly hidden and lay in the dark: but now new Lights have shined forth, and it is granted us to know the Causes of things before hidden, it doth not become prudent Men, and professing Philosophy, even to shut their Eyes and remain blind in the Light it self; but especially about a Disease by which the third part of Mortals have still fallen to this day, to be rather willing to Err with the Antients, than to understand the Truth with the Moderns, or to believe what is more likely, argues a mind guilty of notable stubbornness. When therefore the Puerology or Feaver Tracts of former Medicine, had no firm and stable Basis, and that it is easie to shew that it was built upon very many, and plainly false Errors, what should hinder, but that we having gotten more certain Principles, should endeavour to erect a better Science concerning Feavers? Truly I think it would hardly be, altho' the Pleas of the Antients, should be yet openly maintained in the Schools, but that many Physicians, who have a mind to look within the Bark, would frame new Hypotheses to themselves from their own Ratiocination, by which they might more exactly quadrate the Phenomena of Feavers, than by that of the Antients. But it may be objected, that Feavers have been happily Cured by the same Remedies, and the like Method of Curing, from the times of Hippocrates and Galen, even to our days; and therefore it may seem a rash Work, and little safe, that we should endeavour new things, after having had the Experience of so many Ages, especially since it is about the Human Body.

Body. To this it will be easie to answer, that Medicine was at first Empirical, and Remedies were not invented by general Precepts, or by Rule, but by the frequent trial of several things: And if led by the Example of Hippocrates, his Followers had only polished his Observations and Experiments, without doubt the Medicinal Art had grown up better, more handsomly, and with greater benefit to the Sick. But that the Light, clearly inkindled by the Antients, did so suddenly shut up, and darkned the Eyes of Posterity, it was, the preposterous Study of those, who too hastily framed, almost out of their own Brain, Physick into a general Method, after the manner of some Speculative Science: for by this means, before they had laid a firm Foundation, a sufficiently specious, and deceitful Pile of unstable Doctrin, was erected. That therefore in the Cure of Feavers, some Indications being more antiently received, remain yet confirmed, and are to be perpetually observed, is to be ascribed wholly to Experience, the first Mistress of this Art, and not to the Precepts of Scholars. And from hence, I hope for my self, to have gotten a defence sufficient enough; for if the Opinions wholly erroneous of the Antients, had not hindered, but that the Practice of Medicine, at first instituted by a certain induction of observations, had proceeded commodiously enough; the Theory being joyned with Truth, would have brought much less hurt to the Sick; or have less carried away those exercising Medicine, quite contrary from that Path, which Antiquity had left commended to us. In the mean time, 'tis not to be dissembled, that naked Experience, without the helps of Method and Reason, avails little; yea very often doth much hurt; for neither are the same Diseases, every where to be driven away by the same Remedies. But he seems to have hit the mark, who joyns both together, that Reason may not pervert Experiments, and Nature it self, not that this may remove Reason from its place. Altho' that I know well enough, I have not obtained it, yet I will freely profess, that I have aimed at this Mark; and perhaps I may have deserved some praise, even in failing in these sort of Adventures; for after I had not found in Books, what might satisfy a mind desirous of Truth, I resolved with my self, to search into living and breathing Examples: and therefore sitting oftentimes by the Sick, I was wont carefully to search out their Cases, to weigh all the Symptoms, and to put them, with exact Diaries of the Diseases, into Writing; then diligently to meditate on these, and to compare some with others; and then began to adapt general Notions from particular Events: and when by this means, for a long time, observing the Accidents and Courses of Feavers, I had busied my self, for the finding out forms of Reasons for their Cure, at length a new Pathology of this Disease was conceived in my mind; which afterwards, by the frequent increasing Concurrence of Observations, as it were the Juice and Blood, was formed by degrees into a Child, such as it now appears. But the Infant, which I had ordered to be kept closely, in our private house, being remarkable for Paradoxes, as it were a monstrous shape, the importune diligence of Friends has taken care to bring abroad, being gotten forth of my hands, and to be publickly beheld. What therefore is there said concerning Feavers, besides the common manner, I would not have any one esteem it brought forth by me, as from a Doctor in the Chair: doubting, I bring these thoughts into Publick, and submit them to the Examination and Emendation of the more Learned. That others before me have not spoken all things truly concerning this thing, shall be an Argument, that I may Err, yea (if you please) that I have Erred: however, if I should have rightly traced forth any marks, in this, at least new search of Truth; and shall have incited others (who are far better able) by this occasion, to the full finishing of it; it will not repent me altogether of this, tho' rash beginning.

O F F E A V E R S.

CHAP. I.

The Anatomy of the Blood; and its Resolution into five Principles: A comparing it with Wine and Milk.



THE Doctrine of Fermentation being explicated, it remains that we handle the chief Instance or Example of it, to wit, *Feavers*. For it seems that a Feaver is only a Fermentation, or immoderate Heat, brought into the Blood and Humors. Its Name is derived from *Februo* (or *Purgament*, which also is derived from *Ferveo*, to be Hot) which Word indeed is commodiously put to every *Feaver*; for that the Blood in this Disease grows hot; and besides, by its fervor, as working must, it is purged from its filthinesses. But that this Fermentation or feaverish Effervency may be rightly explicated, these three things are to be considered. First, What the fermenting Liquor is; whether only Blood,

or any humors besides. Secondly, In what Principles in the mixture, and in what proportion of them this Liquor consists. Thirdly, and lastly, By what motion and turgescency of those Parts or Particles, of which the Blood is made, the Feaverish Effervescency is stirred up. These being thus premised, the Doctrine of Feavers shall be delivered, not from the Opinions of others, but according to the comparisons of Reasons, picked (though from ours, yet) from diligent and frequent Observation, and confirmed by certain Experiments; all which however, I willingly submit to the Judgment of the more skilful.

It plainly appears, even to the Sense, that the Blood doth hugely boil up, and rage in a Feaver; for every one (though rude and unskilful) being in a Feaver, complains of the Blood being distempered, and of the same growing hot in the Vessels, and as it were, put into a fury. Also, besides the Blood raging in the Veins and Arteries, it may be lawfully suspected, that that Juice with which the Brain and Nervous Parts are watered, is wont oftentimes to be in fault; for when this Liquor is seen to be carried back from the Blood, into the nervous stock by a constant motion, and certain Circulation, and from thence through the Lymphatick Vessels, into the bosom of the Blood, it is probable, if by reason of a Taint contracted from the Blood, that humor be depraved in its disposition, or is perverted from its equal motion, that from thence the Rigour, and Pain, Convulsion, Delirium, Phrensie, and many more Symptoms of the Nervous kind, usual in Feavers do arise.

After the Blood and Nervous Liquor, two other Humors, for that being apt to grow hot, fall into our consideration, *viz.* The Chyme or nourishing Juice, continually coming to the Mass of Blood, and the serous Latex, perpetually departing from the same, which, though they be the first and last Liquors separated from the Blood, and distinct from it, yet being confused with it, they ought to be esteemed as its associate parts or complements; for the nourishable Juice being fresh brought, is accounted the crude part of the Blood, and to be assimilated; and the *Serum*, it's stale part, and to be carried away. And after this manner, so long as either are circulated with the Blood it self, in the Vessels they participate of the heats of the first begotten Blood, and oftentimes occasionally begin them, or increase them being begun; but by what means these things come to be done, is declared hereafter in their proper places. As to the rest of Humors, which are only the Recrements of the nutritious Juice, or the blood, when they are included, either in their proper Receptacles, or constrained in the narrow spaces in the *Viscera*, neither wash the several parts of the Body with a continual lustration, as the Blood or Nervous Liquor, or the other Humors but now recited, are to be exempted from this Rank; sometimes perhaps they may be the occasional Cause that the Blood doth conceive an undue Effervency, or that it persists in it longer; but it is only the Blood, (with the the Nervous Liquor, the alible Juice, and *Serum* Associates) which

which boiling up above measure, with its heat, and stirred up with a rage through the Vessels, diffuses the preternatural heat, and induces the formal reason of the Fever: but how this comes to be done, is not to be known plainly, but by a more near beholding the Nature of Blood, and as it were an Anatomy made of its Liquor.

There are in the Blood, (as in all Fermentative Liquors.) Heterogeneous-Particles, which as they are of a diverse Figure and Energy, remain a long while in the mixture, by their mutual opposing one another and subaction; the motion of Fermentation is continually conserved; as is perceived in Wine, Beer, and other Liquors: then, if the mixture of the Liquor be somewhat unlocked by the adding of Ferments, the Native Particles being freed from their bonds, do yet more swell up, and induce Fermentation, with a more rapid motion and heat: which is seen in a familiar Experiment of the Chymists, *viz.* when fluid Salts are mixed with saline Liquors of another kind; from thence a great heat and ebullition are stirred up. Wherefore we ought to inquire concerning the Blood, of what Particles it consists, that it should be fit to Ferment, (as Wine, Beer, and other Liquors) of its own Nature: then by the help of what kind of Ferments, both its Natural and Feaverish heats are performed, with warmth, and a more quick motion.

The Mass of the Blood, by the Opinion of the Antients, was thought to consist of four Humors; to wit, Blood, Phlegm, Cholér, and Melancholy: and it was affirmed, that according to the eminency of this, or that Humor, diverse temperaments are formed; and that by reason of their fervors or exorbitances, almost all Diseases do arise. This Opinion, tho' it flourished from the time of *Galen*, in the Schools of Physicians, yet in our Age, in which the Circular motion of the Blood, and other affections of it were made known, before not understood, it began to be a little suspected; nor to be so generally made use of, for the solving the *Phænomena* of Diseases: because these sort of humors do not constitute the Blood, but what are so called (except the Blood) are only the recrements of the Blood, which ought continually to be separated from it: For in truth the Blood is an only humor; not one thing about the Viscera, and another in the habit of the Body; nor is it moved at one time by Phlegm, and another time with Cholér, or Melancholy, (as is commonly asserted) but the Liquor growing hot in the Vessels, is only Blood, and wheresoever it is carried through all the parts of the Body, it is still the same, and like it self. But because by reason of the abundance of the implanted heat in some, and because of the smallness of it in others, the Coction of the Aliment is now quicker, now slower performed in the Bowels, and in the Vessels; therefore the temper of the Blood (tho' but one, and always the same Liquor) becomes diverse: and according to the various disposition of this, it may be said that men are Choleric, Melancholic, or of another temperament. Besides, because whilst the Blood is made in its Circulation in the Vessels, some parts continually grow old, and others are supplied anew, hence from Crudity, or too much Coction, there is a necessity that what is excrementitious should be heaped together: which notwithstanding by its effervescency, (as by the working or depuration of Wines it comes to pass) it is separated from its Mass, *viz.* the watry humor, fixed in the Bowels, or solid parts, is it which is called Phlegm: some Reliques of adust Salt and Sulphur, being separated in the Liver, and received by the Choleduct Vessels are called Cholér; the Earthy feculences being laid up in the Spleen, are termed Melancholy. In the mean time, the Blood if rightly purified ought to want Cholér, Phlegm and Melancholy: even as when some Wines, or Beer are purified, the more light Particles are carried upwards, which constitute its Flowers or Head; and the dregs are prest down to the bottom, which grow together into Feces or Tartar: yet none can truly say it, Wine or Beer is composed of Froth, Tartar, and a Vinous Liquor. But as these humors, commonly so called, are made out of the other Principles, *viz.* Cholér out of Salt and Sulphur, with an admixture of Spirit and Water; and Melancholy, out of the same, with an addition of Earth; and as the Blood is immediately forged out of these kind of Principles, and is wont to be resolved sensibly into the same, I thought best, the common acception of humors being laid aside, to bring into use these celebrated Principles of the Chymists; for the unfolding the Nature of the Blood and its affections. There are therefore in the Blood, as in all Liquors apt to be Fermented, very much Water and Spirit, a mean of Salt and Sulphur, and a little of Earth. The Blood being loosened by putrefaction, exhibits the same separated and distinct. Also in the Blood contained in the Vessels, or being fresh let out from them, we may discover their energies and effects: besides, when in the Food, whereby we are fed, by the Juice of which the Liquor of the Blood is made, these same are implanted, no man will go about to deny that the Blood also is made from them: wherefore I will briefly run through these, and endeavour to shew by what means the Consistency, the Properties, and the Affections of the Blood are made by them.

I. Spirits (which readily obtain the chief place) are a subtil, and greatly volatile portion of the Blood. Their Particles, always expanded, and endeavouring to fly away do move about the more thick little Bodies of the rest, wherewith they are involved, and continually detain them in the motion of Fermentation. The Liquor of the Blood continually boils up with their effervescency or growing hot, and equal expansion in the Vessels, and the rest of the

the Principles are contained in an orderly motion, and within the bond of the exact mixture; if any Heterogeneous thing, or unagreeable to the mixture, be poured into the bloody Mass, presently the Spirits being disturbed in their motion, rage, shake the blood, and force it to grow hugely hot, until what is extraneous, and not miscible, is either subdued, and reduced; or cast out of dores. By the irradiation, or rather the irrigation or watering of these, the Bodies of the Nerves are inflated, the Functions of the Viscera, and also the Offices of motion, and sensation are performed: from the want of Spirits, also from their motion being depraved or hindered, arise great vices of the Natural œconomy or Government. The more quick motion and effervescency of these in the blood, (above what is in Wine) chiefly depends upon the Ferment of the Heart; because, whilst the blood passes through the Bosom of the Heart, its mixture is very much loosened, so that the Spirits, together with the sulphureous Particles, being somewhat loosened, and as it were inkindled into a flame, leap forth, and are much expanded, and from thence they impart by their deflagration, a heat to the whole. By reason of this kind of expansion, and suffusion of heat, there is made a continual expence of Spirits, which being rarified, as it were inkindled, continually fly away, and are evaporated forth adooors: and as long as we live there is made a continual reparation of these by aliments, chiefly the most delicate; which contain in themselves very much of Spirit and swelling matter: from which juice being drawn by digestion, and collated to the blood, is assimilated to it and fills up its defects. When the Blood of Animals is distilled, the Spirits (like *Aqua Vita*) ascend of a limpid colour, they are made very sharp and pricking, by the adhesion of the Salt; yet they are not so easily drawn off, as the Spirits of Wine, but that there is need of a more intense fire to force them, because they are hardly driven from the fellowship of the thicker parts, with which they are involved.

2. That there is plenty of Sulphur in the Blood, it is plainly seen, because we are chiefly fed with fat and sulphureous Aliments, also the Nutriment from the blood, carried to the solid parts, goes into Sulphur and Fatness. It is most likely, from the dissolution of this, that the red Tincture of the Blood doth arise: for sulphureous Bodies, before any others, impart to the solvent *Menstruum*, a colour highly full of redness; and when by reason of too great Crudity, the Sulphur is less dissolved, the blood becomes watery and pale, that it will scarce dye a Linnen Rag red. The Mass of blood being impregnated with Sulphur, and together with Spirits, it becomes very Fermentable: which however, whilst it enters the Ventracles of the Heart, there suffers a greater effervescency, or rather accension; and on the Particles chiefly sulphureous, being inflamed; and thence diffused through the whole, the lively and vital heat in us depends. When the sulphureous part is carried forth, and doth too much luxuriate in the blood, it perverts its disposition from its due state, that therefore the blood being either depraved, or made more bilious or Choleric, doth not rightly Cook the nourishing Juice; or being inkindled throughout, it conceives heats and ardours, such as arise in a continual Fever. For the Sulphur being too much exalted, and swelling more than it ought, stirs up great heats in the blood: and they whose blood is more plentifully impregnated with Sulphur, are most obnoxious to Fevers. By reason of the Particles of this being incocted with the Nutritious Juice, and from thence carried to the solid parts, fatness, softness and tenderness, come to our Body. From the Flesh or Blood putrefying, by reason of the abundance of evaporated Sulphur, a most evil stink breaths forth: In the distillation of Blood, Sulphur ascends under the form of a blackish Oyl, which also by reason of the Empyreuma, stinks most wickedly.

3. That Salt is in the Blood, is evinced by the Salt; which, tho' fixed, is drawn forth, by being eaten, from Vegetables, and from other eatable things, at first less volatile, afterwards by the most excellent digestion of Nature, and Circulation, is highly volatilised; that it passes through, not only without a remaining *Caput Mortuum*, all the members and parts of our Body, but also the blood being exposed to distillation, ascends the Alembic, and leaves the dead Head as insipid earth: If at any time the saline Particles are not rightly exalted in the Blood, by reason of ill digestion, but remain crude, and for the most part fixed, from thence the blood becomes thick and unfit for Circulation, so that Obstructions are begot in the Bowels and solid parts, and serous Crudities are every where heaped together: But if the Salt be too much carried forth, and suffers a Flux, the Spirit being depressed, or deficient, a sour and bitter disposition is given to the blood, such as is observed in Scorbutical People, and those sick of a Quartan Fever. Also from the Salt, for this reason being variously coagulated, the Stone, Kings-Evil, Gout, Leprosie, and very many other Chronical Diseases arise. But when Coction being rightly performed in the Bowels and Vessels, the Salt is duly exalted, and being associated with the Spirit, is volatilised, then by reason of its mixture, the Liquor of the Blood more equally ferments; also is defended from Putrefaction, Stagnation, and Coagulation: Also the saline Particles, bridle the fiercenesses of the Spirits, and especially of Sulphur; wherefore, those who have their blood well filled with a Volatile Salt, are less obnoxious to Fevers: also hence those who often are let blood, are more apt to Fevers.

4. Besides, There are in the Blood, (as it is a thick Humour, and hath a gross consistence) many Earthy Particles: from hence also, its too great Volatilisation is as it were supported, and its too hasty accension hindered: even as Charcoal-dust, is added oftentimes to Gun-Powder in a greater proportion, that all its parts may not take fire at once, and too soon. Further, from the Terrestrial Particles of the Blood, and Nutritious Juice, the bulk and increase of the Body proceeds. Lastly, from the distillation of the Blood, a light and friable *Caput Mortuum*, is left in great plenty.

5. Upon the watery part of the Blood depends its fluidness; for from hence its stagnation is hindered, and the Blood is circulated in the Vessels, without growing thick or stiff: also its too great conflagration, and adustion is restrained, and its heat attempered. When Blood is distilled a clear and insipid Water is drawn off, at least in a double proportion to the rest; for from hence the matter of Urin, Sweat, and every humid Excrement, for the most part proceeds.

What things were but now asserted, concerning the Principles of the Blood, and the affections to be deduced thence, will better appear, if we consider a little the Blood, according to its sensible parts, and shall compare it with other Liquors which are in daily use amongst us. Those sort of Liquors, which have a very great Analogy with the Blood, are, *viz.* Rich Wine and Milk. As to the Reasons of Fermentation and growing Hot, it is most fitly compared to Wine; as to its consistency, coagulation, and departure of the parts one from another, it is likened to Milk,

In the first place therefore, it is observed of Wine, that so long as it is shut up in the Vessel or Pipe, its subtil and spirituous Particles, do perpetually agitate, or very much shake others more thick, break them, and render them fit for an exact mixtion; what is heterogeneous, and unfit for subaction or mingling, is separated by its growing hot: In the mean time the purified Liquor greatly fermenting, is in perpetual motion, whereby all the parts (as Atoms, variously moved up and down, in a beam or streak of light) do stretch themselves forth on every side, and contend with a constant rowling about, from top to bottom, and from thence to the top again. By the attrition and refraction of the Particles, very many *Effluvia* of Atoms, go away from the Liquor, which if the Vessel being closely shut, they are kept within; the Liquor grows too excessively hot, and oftentimes causes the containing Vessel to burst in pieces. Blood, much after the same manner being shut up within the Veins and the Arteries, is urged with a constant Circulation: The Vital Spirit makes subtil, breaks, and exactly molds the more thick Particles; what is heterogeneous, and not mixable, it expels forth of dores; in the mean time by the refraction and kneading of the parts, *Effluvia* of heat do constantly stream forth, and evaporate through the pores; which being shut in, if transpiration be hindred, presently by reason of the too great boiling of the Blood a Feaver is inkindled.

Secondly, We will observe concerning Wines, that they grow turgid, or swell up, if any extraneous thing, and of a Fermentative Nature, be poured to them; yea sometimes, that they are moved more than ordinary of their own accord. For, when by a long digestion, the sulphureous part of the Wine is too much exalted, it conceives a greater heat than it ought, and (unless presently appeased) perverts the disposition of the whole Liquor, with its swelling up. It seems to be for the very like reason, that the Feaverish heat which is wont to be introduced by reason of the same Causes, is stirred up in the Blood, as shall be shown in the next Chapter, where we treat of the Motion and Heat of the Blood.

The third Observation, or comparing of the Blood with Wine, shall be of this sort: Wines (as also many other Liquors, as for example, Beer, or Sider) have their times of crudity, maturation, and defection. For when they are first made, the spirituous parts are so obvolved by the others more thick, that they shew themselves but little, and put forth almost nothing of strength or virtue: and as the other Particles, are not yet subtilised, nor truly concocted, the whole Liquor remains crude, and of an ungrateful taste; and if put to distillation, not any Spirit ascends. From this state it comes by degrees to perfection, and when the Spirits being extricated from their intanglements, obtain their own right, and have subtilized and exalted the more thick Particles of the rest, the whole mass of the Liquor becomes Clear, Spirituous, Sweet, and Balsamick. Lastly, When by a long Fermentation, the Spirits are consumed, and begin at length to fail, the state of defection is induced, whereby Wines, and other Liquors, either pass into a tastelessness, or at last the Salt and the Sulphur being too much exalted, are made sower or unsavory. In like manner the Blood also, while it is Circulated in the Vessels, may be considered according to this kind of threefold disposition: First, in the making or crudity, which has relation to the Chyme new made in the *Viscera*, and freshly poured to the Blood; the Particles of which, like to unripe Fruit, are crude and undigested. Secondly, In the perfect state or maturation, which belongs to the Blood being sufficiently wrought, and made Volatile, according to all its Particles after it is inspired by Ferments, and its inkindling in the heart exalted. Thirdly, In its defection, which respects the Blood; after it hath burned forth, and its spirituous parts are very much flown away, and the rest growing old and poor, have need to be removed; and so they are

either

either the Reliques of Salt, which are with the *Serum* strained forth continually by the Urine; or they are Particles of Salt and Sulphur, boiled and baked together, which are strained forth by the virtue of the Liver into the choleduct Vessels: or lastly, they are dregs and earthly rements of the Blood it self, which are carried into the Spleen, and there (as it were a *Caput Mortuum*, exalted by a new digestion) go into a Ferment, at length to be transmitted to the Blood: Whilst after this manner, the generation of the Blood, and its due maturation are truly dispatched, it is pleasingly circulated within the Vessels, neither wanting in motion or heat, nor inordinately troubled with them. But if either the supplement of the nourishing Juice, be not made agreeable with the rest of the Blood, nor assimilated with it, but that either by reason of the defect of Concoction, it is washed into a very crude humour, or because of its excess, it is rosted into a burnt matter; or if the Blood growing old, does not lay aside what it casts off, and give way to a new nutritious Humor; I say, by reason of these kind of Vices, concerning Sanguification, or the making of Blood, the Blood is variously perverted from its due temper and equal motion; and now becomes watery and cold; now sharp or salt; now acid, austere, or by some other way degenerate; and sometimes obnoxious to stagnations, and sometimes to immoderate heats.

We may observe these kind of degrees of Crudity, Coction, and Defection in the Blood; both of the sound and of the sick; in healthful persons after a more plentiful Repast, Surfeit, or hard Drinking, when too much of *Serum* or of Juice, is poured to the Blood, its whole Mass being too much diluted with a crude humor, becomes more watery, and less spirituous; wherefore men are rendered sluggish, and unfit for motion or exercise. In sick persons the Phlegmatic Constitution of the Body, induces such a crudity of the bloody mass, as is discerned in the white Dropsie, the Dropsie, *Pica*, or longing Disease, and the *Chlorosis*, or Green Sickness. Also the state of this kind of crudity, comes in an intermitting Fever, and in truth is the cause of the Feaverish accession, viz. by reason of the dyscrasie of the Blood; the nourishing Juice being heaped up, is not assimilated to it, but for the most part goes into a crude, or otherwise degenerate matter; with which, when the Mass of Blood is filled to a plenitude, swelling up; it brings on the Fit.

The state of Maturation, concoction being finished, happens in healthful persons; some hours after Eating, especially in the morning, to wit, when the supplement of the Chyme is spiritualized, and as it were enkindled in the whole, by reiterated Circulations; for then men are made more nimble and lively, and more ready for studies, or any business.

The state of Defection is in the blood of sound men after fasting long, hard labour, and want of Food; for then the Vital Spirit being very much evaporated, the mass of the Blood begins to become as it were lifeless, wherefore they presently languish, and are made weak. Moreover, the blood by a too long coction is burned, and grows bilous, from whence those accustomed to want Food; or fasting, for the most part become sad and melancholic. Some Diseases habitually induce such a disposition of the blood; such are the Scurvy, the yellow Jaundies, the Cachexia (or evil state of the body when the nourishing Juice turns to ill humors) long Feavers, and most Chronical Diseases, in which, the whole mass of blood passes from a spirituous, into either a sour, sharp, or austere Nature.

So much for the comparing of blood with rich Wine; what follows, being a similitude of it with Milk, consists in the diversity of the parts, and their settling apart, which is chiefly seen in its being let forth from the Veins, and grown cold in the Dish. For when the heat and vital Spirit, which conserve all things in the mixture, are flown away, the remaining parts depart from one another of themselves, and a separation of the thin from the thick, and of the *Serum* from the fibrous blood is made. This sort of separation of the parts, succeeds almost after the same manner, as in the coagulation of Milk. There are in Milk, Buttery, Cheesie parts, and Whey: The like is in blood, so long as it doth not much recede from its natural temper: for it is good, when being let forth of the Veins, it grows cold in the Porringer, its parts do settle after the same manner; to wit, the more pure portion, and sulphureous (like Cream) comes together on the Superficies, which in healthful people, looks brightly red, and this answers to the flowering or head of the Milk: under this lies a purple thick substance, which consists of little Threds and Fibres joyned together, and as it were concreted into a clotty substance or parenchyma, such as the Liver: For the heat being consumed, and the bond of the mixture loosened, the Fibrous parts lay hold on one another, and by their weight, settle into a more thick Coagulum, which answers to the Cheesie part of the Milk: In the mean time, the Serous or Wheyey parts, being thrust forth from the rest, get their own Nature, and constitute a clear Liquor, like water; which as it is thinner, ascends to the top, and swims upon the rest. Further, as the Whey of Milk is wont to be further coagulated, and doth yet contain in it self some parts both Buttery and Cheesie; so this Liquor swimming on the Blood, if it be exposed either to the fire, grows thick, like the White of an Egg a little rosted, or if an acid Liquor be powred to it, it will be precipitated into a white Coagulum. This being seen, some have thought this watery Latex, to be the nourishing Juice, which imparts nourishment to the whole Body, from the mass of the

the blood, in the time of its Circulation, and that the rest of the blood is only the Vehicle of Heat and Spirits, and serves for no other use. But to me it seems more likely, that in this watery Liquor is contained the nourishing Juyce, which is employed on the Nerves, and the commonly termed Spermatie parts, for nourishment is supplied to the Musculous stock, from the fibrous blood of the Parenchyma, or the Liver, Lights and Milt. After this manner, blood being not much vitiated, goes into parts like Milk; but if it be exceedingly depraved, when it settles, it shews a far different disposition, and as to its single Contents, is allotted into various appearances; for the Cream growing together on the top, is seen to be sometimes white, sometimes green, now yellow, or of livid or Lead colour; also it becomes not tender, but very viscous or clammy, that like a Membrane, it can scarce be pulled in pieces. When the blood long growing hot with a Feaverish Distemper, is let forth from the cut Vein, in its Superficies, instead of a Scarlet Cream, there grows together often a white Skin, or of some other colour; the reason of which is, because the blood is thoroughly roasted, by two great Ebullition, and its more pure portion, as it were by a certain elixation, is boiled forth from a red and tender substance, to a white and tough; but if in the mean time the bloody mass be not sufficiently purged from the adust recrements of Salt and Sulphur, the colour of this little Skin becomes yellow or livid, and therefore the Water swimming over it, is often tinged by the same means. Further, the Purple Crassament or thick substance is also various, viz. sometimes it is of a blackish colour, when the blood is scorched too much, by a long effervescency. When the Fibres are vitiated, as in the Liver, they grow not together, but the Liquor like Beasting Milk, remains somewhat thick, and yet fluid; which indeed argues a great corruption of the blood; as uses to happen in a putrid Feaver, a very great Cachexy, sometimes the watery Latex is wanting, as in Hectical people, and in too great a Diaphoresis. Sometimes it superabounds, as in Dropsical people, neither will the whole go into a white Coagulum, by heat: In some Cachectical people, the blood being made more watery, appears like watered flesh. I knew one endued with a vicious habit of Body, that was wont to have blood of a whitish colour, and like to Milk when it was let forth, and afterwards, when he grew better by Chalybeat Medicines, his blood was moderately red; but concerning the settling of the blood, and its appearances, there is enough. But as blood being emitted from the Vessels by its coagulation and departure of the parts one from another, imitates the various substances of congealed Milk, so sometimes being shut within the Veins and Arteries, like some fused by a Coagulum, enters all together into the like mutation from Morbific Causes; by reason of which change, being hindered in its Circulation, or somewhere congealed and fixed according to its portions, it produces many Distempers: for it seems, that from hence the Pleurisie, the Squinancy, the Inflammation of the Lungs, the Dysentery, take their Original, and to this Cause the Pestilent Diseases owe chiefly their deadliness, as shall be said hereafter in its place.

It is sufficient that we have hitherto drawn a parallel of the blood, from which comparison with Wine and Milk, may be gathered what sort of Particles and Substances it comprehends in it self, viz. Spirituous, and very agil or nimble (such as generous or rich Wine has) for the heat and motion; and besides soft and tender (such as are in Milk) for the nourishment of the Body. Yea also, this Analogy of it with Wine and Milk, is yet further confirmed by the use of them in our Diet, out of which the blood is generated; forasmuch as Milk is the best and most simple Aliment, and with it Infants, and Children, who have need of a plentiful provision of blood, are nourished chiefly: But Wine copiously begets Vital Spirits before all other things, and being weak and fallen, excellently restores them; wherefore it is wont to be esteemed instead of Nectar for old men, or those of ripe years.

The Nature and Analysis of the blood flowing within the Vessels, being opened after this manner, the nutritious Juice deserves yet our consideration, being supplied from the blood, and separated out of the mass of blood, for the nourishment of the solid parts, and cleaving to them (whereby it may be the better assimilated) like Dew. For the Nerves, tendons and the rest of the solid parts of the whole Body, are washed with a certain alible Juice. The Vital Spirits, having obtained the Nervous Bodies for a Vehicle of this, blow them forth at length, and expeditiously execute the actions of Sense: also that Humor coming upon the solid parts, and assimilated with them, enlarges their Bulk and Growth. This is not a place to enquire after the Origin, Birth, and manner of the Dispensation of this: It shall suffice only that we have noted, that it is supplied from the mass of blood, and (as it is rendred highly probable by the most Learned Dr. Glisson, and Dr. Wharton) after it hath past through the Nervous part by a certain Circulation, what remains, being now made as it were poor and lifeless, is sent back by the Lymphatic Vessels, to the blood. Whilst this Juice, being little costed, or purged from dregs, is sent from the depraved blood, to the Nervous parts, 'tis wont variously to irritate them into Cramps and Convulsive Motions; also, no few Symptoms in Feavers, arise by reason of the depravation, and irregular Motion of this Juice, as shall be more largely laid open in another place.

C H A P. II.

Of the Motion and Heats of the Blood.

SO much for the Anatomy of the Blood, as to its primary Elements and constitutive parts, into which it is sensibly wont to be resolved; also as to its Affections, which appear clearly, by the comparing it with Wine and Milk: it remains for us next to enquire concerning the motion of the blood, both Natural, *viz.* by the help of what Ferment, and by what swelling up of parts, it is Circulated in a perpetual motion through the Vessels) and preternatural, *viz.* for what Causes, and what fury of parts, when it boils up above measure in the Vessels, and conceives Feaverish Effervescences: These being rightly unfolded and premised, we will enter upon the Doctrine of Feavers.

Concerning the Natural Motion of the Blood, we shall not here enquire of its Circulation, *viz.* by what Structure of the Heart and Vessels, it is wheeled about after a constant manner, as it were in a Water-Engine; but of its Fermentation, *viz.* by what mixtion of parts, and mutual action of them together among themselves (like Wine fermenting in the Ton) it continually boils up. And this kind of motion (as it were truly an intestine war of the Blood) depends both on the Heterogeneity of the parts of the Blood it self, and on the various Ferments, which are breathed into the mass of the Blood from the Bowels.

As to the first: those things which have altogether like Particles, do not ferment, wherefore neither distilled Waters, Chymical Oyls, Spirits of Wine, or other simple Liquors are moved, as hath been already observed: but I have said, that Blood, according to the Nature of things quickly irritable, doth consist of a proportionate mixture of the Elements; in which Spirits, for that they are very nimble, continually strive to expand themselves and to fly away: but being entangled by the more thick Particles of the rest, they are detained in their flight. And being detained after this manner, they toss about, break to pieces, and very much subtilize the more thick little Bodies, by which they are hindred; they volatilize the Salt, otherwise fixed; by a most minute kneading, and by the adhesion of it, they perfectly dissolve the Sulphur, compacted in it self, and not miscible with the rest, and boil it in the *Serum*. They break the Earth, even to its smallest parts, and mingle it with the rest. But in the mean time, by the striking and molding the Salt and the Sulphur, *Effluvia's* of heat plentifully proceed, which being mixed with the rest, and on every side diffused, increase the motion of the Fermentation. And after this manner all being most minutely broken and diluted with watery Particles, they constitute the Liquor of the Blood, which whilst in the Vessels, as Wine shut up in a Pipe, continually ferments, and according to all its Particles is in perpetual motion.

But the Fermentation of Wine and of Blood, differs in this; that in Wine there is no wasting of the old parts, and a coming again of new; but the Liquor being shut up in the Vessel, remains still the same: but 'tis otherwise in Blood, in which some parts are continually destroyed, and in their place others are always generated anew. In Wine, the times of crudity, maturation, and defecation, are distinct, and are successively performed in the whole: In Blood, that threefold state is celebrated at the same time and by parts: Fermentation being once begun in Wine, is continued even to the end; but in Blood, because it is washed still with crude Juices, it ought still to be renewed; by which means, the Nutritious Particles, not of kin, are assimilated to the rest of the Latex; wherefore, for this work, besides the Fermentation once begun in the Blood, there is need of some Ferments, which may continue the same, otherwise about to leave off.

That Ferments are required for the making of Blood, this is an Argument; that when they are wanting by Nature, they are with good success supplied by the work of Art: for fixed Salts, Alkali Salt, Extracts, Digestives, Openers, and especially Chalybeat Remedies, help for this reason, that, as it were by a certain Ferment, they restore anew, the weak, or almost extinct Ebullition, or boiling of the Blood.

As to what respects the Natural Ferments, very many may certainly be formed, and in divers parts, or hid in the Bowels; for any Humor in which the Particles of Salt, Sulphur or Spirit, being much exalted, are contained, puts on the Nature of a Ferment: after this manner, the flowing or dregs of Beer or new Wine, being kneaded with Meal, and the Mass kept to sourness, come under this rank, by which new Beer, and the like Liquors, as also the Mass of Bread, are more excellently fermented. In like manner in the Ventricle, a sourish Humor participating of exalted Salt, there helps Concoction: and in the Spleen, the feculencies of the Blood from Salt and Earth being exalted, go into a Ferment-

How much vigor comes to the Blood from the Womb and Genital Parts, appears from hence, because by the privation, or evil disposition of them, follow, in Maids the Green-sickness, in Men, Barrenness or loss of Virility, want of Beard, and a shrill Voice. But the chief Ferment, that serves for sanguification, is established in the Heart; for this is the chief fire-place, in which the cruder Particles of the Chyme, are as it were inkindled, and acquire a volatileness: which thing may be confirmed by many reasons, but especially by its effects, which we suffer in the Precordia, as often as the Blood ferments more or less than it ought to do: for when it is too much inkindled in the Heart, it is agitated impetuously, as it were by fires put under it; the signs of whose immoderate Ebullition are, a deep pulse and vehement, then almost an intolerable heat in the Precordia, with a vehement thirst; on the other side, when the Fermentation of the Blood is lessened in the Heart, we are affected with an anhelous, and difficult respiration upon any motion; as may be perceived in the Dropsie, Cachexia, and Yellow Jaundice: the reason of which is, not because the Lungs are stuffed, or filled full of a tough or clammy matter; but because the Blood doth not rightly ferment, in that Repository of Fermentation; wherefore, being fallen into its Bosom, it is not presently Rarified; nor doth it soon leap forth into the Lungs, but being apt to stagnate, and remain there, causes an oppression of the Heart it self; for the helping of which, frequent breathing is made, that the Blood being let forth into the Lungs, succour might be brought to it: but if by motion or exercise, the Blood be more provoked into its Ventricle, than can be derived by respiration, or the pulse, into the Pneumonic Vessels, there is danger of choaking. The like happens in those that are dying: when the pulse is very small, and the Blood being heaped up in the Heart for want of Fermentation, begins to stagnate and to clodder, we then breath deeply, with a noise and elevation of the breast; to wit, the Blood with the ultimate endeavour of Nature, and the whole force of the Lungs, as long as it is able to be done, is emptied forth into the Lungs, lest residing in the Heart, it should wholly choak it.

Therefore, Motion and Heat, in the Blood, depend chiefly on two things, viz. partly on its own proper disposition and constitution, by which, it being forged very greatly with active Principles of Spirits, Salt, and Sulphur, of its own accord swells up, or grows turgid in the Vessels, even as Wine in the Ton: and partly on the Ferment implanted in the Heart, which very much rarifies the Liquor passing through its Bosom, and makes it to leap forth with a frothy heat: that the Blood, which is quietly instilled to the Heart through the Veins, running gently like a River, from thence leaping forth through the Arteries, (like a Torrent) with noise and rage, might be carried forward, to all the parts of the whole Body. By what means this is done, though it is not easie to explicate Mechanically, yet the manner, and some not improbable reasons of this thing, are delivered by most Learned men, *Ent, Cartes*, and others. They suppose indeed, as it were a fire to be set in the Chimny of the Heart, which presently inkindles the Blood infused through the Veins, (even as a flame put to Wine burns it) which being so inkindled, by its deflagration (like lightning) passes most swiftly through the Arteries: so that heat, a most rapid motion, and *Effluvia* sent by Perspiration, are wont to proceed from the accension of the Blood in the Heart only. *Hogelandus* affirms, that there is a Ferment hid in the Bosom of the Heart, that compels the Liquor of the Blood to boil up, and to grow hot, with heat, and a plentiful emission of Soct, just like Spirit of Nitre, when it is poured on the Butter of Antimony: so that the Blood, flowing in gently through the Veins, being forthwith Rarified into spume and vapour by the ferment of the Heart, runs very impetuously through the passages of the Arteries. 'Tis almost the same thing, whether it be said to be done, either by this, or by that way: for the alteration which the Blood receives in the Heart, may be equally deduced from a flame, or a Nitrous Sulphureous ferment, there supposed to be placed. Because, whilst the Blood slides into the Ventricles of the Heart, presently the frame of the Liquor is loosned, and the active Particles, especially the Spirituous and Sulphureous, the bond of the mixture being broke, do leap forth from the rest, and strive to expand themselves on every side; but being kept in by the Vessels, and being forced together with the remaining Liquor, through the open passages of the Arteries, they rush with violence, and swelling up by the way they can find, and by that means, diffuse *Effluvia* of heat, through the whole body: there is little difference, be said to be done by Accension, or by Fermentation, forasmuch as by either way, the frame of the Blood may be so unlocked, that from thence the Particles of Spirit, Salt, and especially of Sulphur, being incited into motion, (as it were by an inkindled fire) may impart heat to the whole Body.

But this Rarefaction, or Accension of the Blood in the Heart, very much depends upon the disposition and constitution of the Blood it self: for if its Liquor be rightly cocted, being made volatile, and (like rich Wine) brought to maturity, it then Ferments there after its due manner, whereby the soluted Particles of the Spirits and Sulphur, diffuse an equal, and moderate heat to all parts. But if the blood, by reason of an ill manner of feeding, and want of Concoction, be crude and watry, then it is less inkindled in the Heart; and from thence follow a

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frigid intemperance of the whole, difficult breathing and wheezing, with a weak pulse, and languishing; as in Cachectical people, those distempered with the Green-sickness, and such as are about to die, may be perceived: but if the Blood becomes too luxuriant, and apt to grow turgid, by reason of plenty of Sulphur being carried forth, or of its *Effluvia* being restrained, or of eating hot things; either its Accension or Fermentation in the Heart, is very much increased, so that from thence a Feaverish heat, and greater effervescencies than usual, are stirred up in the whole. This various Fermentation of the Blood in the Heart, according to the various temper of the same, may be illustrated by the example of Wine: fresh Must, that is yet crude, though it be boiled, or put on the fire, will not burn; but this being purified and brought to maturity, is easily inkindled, but sends forth a small flame, and quickly out. The same at first growing hot, or otherwise warmed, if inkindled, is greatly inflamed, and for the most part is consumed by its burning.

Whilst the Blood, after this manner being rarified, or inkindled in the Heart, and from thence growing hot, through the passages of the Vessels, is resolved into minute parts, some little bodies depart from its loosened frame, which refuse at last to be united, and fitted with the rest of the Liquor: but these are of a twofold Nature; either thin, which like smoke from the burning fire, or *Effluvia* from a Fermenting Liquor, do evaporate from the Liquor of the Blood, by a constant Diaphoresis, through the breathing holes of the Body; or more thick, which like ashes left after burning, or the settling dregs after Fermentation, ought to be soon strained from the mass of Blood, and to be carried forth of dories: for otherwise, by their confusion, they produce notable perturbations in the Blood. Whereby the Blood growing more hot, is dissolved in the Heart, therefore these Recrements, both Fuliginous and Earthy, are more plentifully heaped together; and when by reason of too great congestion, they cannot be presently subdued and secluded from the mass of Blood, they bring forth a swelling up of the Blood and Feaverish Heats.

Concerning the Motion, Heat, and Natural Fermentation of the Blood, in the equal tenor of which, the means of our Health consists, what hath hitherto been spoken, shall suffice. We will treat a little more largely of the preternatural, or too great effervescency, on which the Types, and Paroxysms of Feavers depend: I call that too much, or Preternatural Fermentation, when the Blood, (like a Pot boiling over the fire) grows hot above measure, and being rarified with a swelling spume, distends the Vessels, excites a more quick pulse, and like a sulphureous Liquor, having taken fire, diffuses a burning heat on every side.

This kind of motion or Fermentation of the Blood, will be best of all illustrated by an example of Wines growing hot. For Wines, besides the gentle and equal Fermentation, by which they are at first purified, at some times do so remarkably grow hot, and boil up, that they fly out of the mouth of the Vessel, and if they are closely stopped up, cause it to burst in pieces. After this manner, as if struck with fury, unless they are immediately drawn away from the Tartar; or their Lees into another Vessel, they will not cease from growing hot, until the Spirit being very much loosened, and the Sulphur or Salt too much exalted, they are either made unfavoury, or degenerate into a sowness.

Such an Effervescency is wont to be stirred up for two causes chiefly: First, When any extraneous thing, and not miscible, is poured into the Ton, (so some drops of Tallow, or Fat, being dropped into the Cask, will produce this motion) or secondly, when Wines being enriched with too rich a Lee or Tartar (by reason of the sulphureous parts being above measure exalted) conceive heats of their own accord, and exceedingly boil up. For in whatsoever substance Sulphur abounds, and its Particles being loosened from the mixture, confocate together, and are bound close in one, there such immoderate heats are procured.

After a like (tho' not wholly the same) manner, whereby Wines grow hot, the boiling up of the Blood is induced; to wit, either what is foreign, and not akin to the Blood, is mixed with it, that when it is not assimilated, is wont to cause a Perturbation, and growing hot, until that Heterogeneous thing, is either subdued or cast forth of dories; and the Particles of the Blood being confused and troubled, are at last shaken forth, and that they get again their former place and position in the mixture. Or, Secondly, the Blood grows hot above measure, because some Principle, or its constitutive Element, (*viz.* Spirit or Sulphur) is carried forth beyond its Natural temper, and becomes enraged; whereby indeed the Particles of this or that, being not agreeable to the rest, are loosened from the mixture; being loosened, they become more violent than they ought, shake much the Liquor of the Blood, and bring forth a heat, which is not allayed, till the Blood being as it were inflamed, burns forth with the long fire of a Feaver. By either way, whether the Blood grows hot in the Vessels, by reason of the pouring in of a thing not miscible, or by reason of the rage of the Spirit, or Sulphur being carried forth, because from thence its frame is more loosened, therefore it is more inkindled in the Heart; and the active Particles first loosened from the Ferment there implanted, do grow exceeding hot, leap forth from the mixture, and disperse on every side by their motion, a strong heat, and as it were fiery: but yet with this difference, that the Effervescency, which depends upon the mingling

mingling of some extraneous thing with the Blood, is for the most part short, or renewed, which, when what was Heterogeneous is separated or subdued, is quieted of its own accord, and the shaken parts of the Blood, and put out of order, easily return to their Natural site and disposition. But the Ebullition which arises from the inordination of the Spirit or Sulphur being enraged, is continual; to wit, here the whole mass of the Blood is so loosened, and dissolved from the strict bond of the mixture, that as an Oily Liquor having taken fire, it ceases not to grow hot, or to be inflamed, till the Particles of Spirit, or Sulphur, or the combustible matter, be for the most part burnt out.

There remains yet a third manner of Preternatural Fervency, whereby the Blood is subject to alteration, which happens not to Wine, but most often to Milk; viz. when at any time, from a Morbific cause, a coagulation of its Liquor is induced, so that its substance is poured forth, and goes into parts, and there is a separation made of the thick and earthy from the thin; by which means the Blood is not fitly circulated in the Vessels, but that its congealed portions, being apt to be fixed in the extrem parts, or to stand still in the Heart, do interrupt the equal motion, or grievously hinder it: For the sake of the restoring of which Effervency, greater are wont to be stirred up in the Blood, to wit, such as happen ordinarily in a Plurisie, the Plague, Small Pox, or the Venereal Disease.

CHAP. III.

Of Intermittent Feavers or Agues.

BY the Premises which we have spoken of already, concerning the Anatomy, Motion, and Heats of the Blood, there now lies open an easie passage to the handling of Feavers. The Notions which are commonly set forth, concerning a Feaver, out of the force and Etymology of the word, I here purposely omit: It may be described after this manner, that it is, An inordinate motion of the Blood, and a too great Heat of it, with burning and thirst, and other Symptoms besides, whereby the Natural œconomy or Government, is variously disturbed. As we have remarked already, concerning the growing hot of the Blood, so now we do of a Feaver, that indeed, its accession is either short, and by fits, which is therefore termed Intermittent; or else great, and long protracted, which is called a continual Feaver. We will first speak of the Intermittent Feaver.

Tho' an intermittent Feaver, in our Popular Idiom, is known by a proper Name, and is distinguished contrary to a Feaver commonly taken, yet because it hath too great Effervency of the Blood joyned to it, it is to be called a Feaver. It is peculiar to this, from a continual Feaver, that it hath certain remissions, or times of intermission; that every fit begins with cold or shaking, for the most part, and ends in sweat; that the accessions or coming of the fits, return at set Periods, and certain intervals of times, that a Clock is not more exact. Wherefore, we will first discourse concerning this Feaver in general, what sort of heat of the Blood it is which continues its fit, and from whence it is raised up. Secondly, Wherefore the fit appears equally with cold and shaking, as with sweat following. Thirdly, What may be the cause of the Intermission, as also of its certain set Periods. Fourthly and Lastly, Are added some irregularities of Intermittent Feavers, as when now cold, now heat or sweat is wanting; or when the Periods are wandering and uncertain, when the Remission or space of Intermission, is not equal, but now comes sooner, now later, and sometimes redoubled: and I will endeavor to shew the reasons of these, and of other Phenomena or appearances, which variously happen in this Distemper. These being laid open, we will go on to unfold in the next Chapter, the division of an Intermittent Feaver, and the kinds of it.

As to the first: The Effervency of the Blood in an Intermittent Feaver, (or Ague) for the time of the fit, is as violent and strong as in a continual Feaver: wherefore, it is concluded, that the parts of the Blood, among themselves, or some heterogeneous thing being mixed with it, do strive together, and ferment above measure. But there is required, that they may ferment, or too greatly boil up among themselves, that some Principle, as chiefly Spirit or Sulphur, being too much exalted and enraged, do appear above the rest; which, when it cannot be yoked with them, brings in a continual strife and heat: but from this cause, a continual Feaver draws its rise, because such an Ebullition of the Blood, being once begun, is not suddenly allayed, and when it is appeased, it does not afterwards presently return. Wherefore for an Intermittent Feaver, 'tis to be supposed, that some heterogeneous thing is mingled with the Blood, whose Particles, when they are not assimilated, make so long an Ebullition of the same, till either being kneaded, they are rendered miscible, or being subtilised, are shut forth of doors. Wherefore, such a matter being brought under, or
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shut forth of dores, the fit ceases, and when this matter springs again, it stirs up a new Ebullition, and so a new fit is brought on.

Concerning this Matter, which being mixed with the Blood, induces the periodical Heats, and the other Symptoms of an Intermitting Fever, 'tis very ambiguously, and diversly disputed among Physicians, where it is generated, in what seat or place it lodges, and by what means it so exactly observes the times of its Motion, and Ebullition. But it would be a work of too much labour and tediousness, to recount here all the Arguments, of the Ancients, and Moderns, to reduce them into order, and to weigh their reasons; Wherefore, doubting, I propose what has come into my mind, when I thought deeply of the matter, and submit to the Judgment of others.

Of necessity there is something, which brings in the Heat of the Blood exactly periodical, that is generated in our Body at the several periods, or accessions of the Fever, always in a set measure, and equal proportion, and is communicated to the mass of Blood; with which when the Blood is filled to a plenitude, it forthwith grows turgid, and conceives an heat: But this is supposed to be either an Excrementitious humor, sliding down into some Mines, which by degrees, and at a set time, being brought to an increase, and moved, Ferments with the Blood: or it is the nutritious Juice, supplied from the matter of Food, and delayed in weight and measure, which, when it is not assimilated, by reason of a defect in sanguification, being heaped up to a fulness, for its own expulsion, induces a turgency in the Blood. The reason of Intermitting Fevers, is commonly explicated by the former way, and the causes of the Intermision, and set times of approach, are fetcht from the nature of the Humor, and the seat, or place where it is cherished. The Nest, or Mine of this Disease, almost by an unanimous consent, is fixed on the first shop of the Body, and from hence the reason of the Intermision is fetched, and the continual difference of an Intermitting Fever: but they affirm the matter to be Choler, Phlegm, and Melancholy; and as these humors are said to putrify slower, or sooner, so the Feaverish courses, are said to be absolved, in the space of one or more days. But this Opinion, after the Circulation of the Blood hath been made plainly known to all, is deservedly rejected. For when the Blood never stagnates in the Vessels, but washes every place with a perpetual motion, and continually carries away their filth, it is impossible that the Mine of this Disease should subsist in the Mesaraick, where it is commonly asserted to be: as to what belongs to the cavities or dens, for the heaping up of the humors in the Viscera, it neither appears, by what means such should be formed without a Tumor or Imposthume; nor by what instinct, such humors, shut up in their Nest, do increase, are consumed, and lastly spring forth again, at so exact intervals of times. Besides, what is affirmed concerning Bile, Phlegm, and Melancholy, and of their periodical motions, we hold wholly suspected; because these sort of humors, are not afforded sincere, such as are described in the Schools: but the Blood, having gotten a various disposition, now being hotter, now colder, its nature imitates the qualities of such humors; or in its Circulating, it lays aside its Recrements, which being deposited in little Chests or Vessels, are falsely believed to be Morbific, and Preternatural humors. Wherefore, as the nutritious Juice, is the only humor where-with the mass of Blood is daily refreshed, and its supplements are made still in measure, and proportion, without doubt, the periodical heats of the Blood, are to be drawn from the accession and commixion of this.

I have already remarked concerning the Particles of the Blood, a triple state of crudity, maturation, and defection: to wit, the nourishing Juice, supplied from the daily Food, comes crude, is mixed with the Blood, and being for some time Circulated, is assimilated to it, and is ripened into a perfect humor: afterwards growing stale, it goes into parts and is laid aside. Whilst after this equal manner, the Blood is continually restored, and its losses repaired, it very quietly Ferments, without any trouble, or immoderate heat, and is Circulated within the Vessels; but if the supplement of the nourishing Juice, is not (as before) ripened, nor goes into Blood, by a perfect digestion, its Particles being confused with the Blood, remain as it were some Heterogeneous thing, and not exactly akin, in the mass of Blood; with which, when it is filled to a plenitude, the Blood forthwith grows troubled, and conceives a Feaverish heat, whereby the fresh supply of this depraved Juice, is either overcome, or cast forth of dores. I say, therefore, from the first instant, in which the nourishing Juice is not assimilated with the Blood, its Particles, though mixed with it, are as yet Circulated with it, without any great tumult or perturbation, and so afterwards, till the mass of the Blood is filled with them to a turgency: but then it quickly boils up, and conceives a heat: almost after the same manner, as new Beer put into Bottles, which, if they are closely stopped, that nothing may evaporate, is at first contained in those Vessels, without heat, or force; afterwards, when the *Effluvia* being still restrained, the mass of the Liquor swells up, notably Ferments, and by reason of the force of Fermentation, oftentimes makes the Bottles fly in pieces: also this happens at a set time, and in the space of so many hours, as in an Intermitting Fever, the Liquor arises to its height of turgency.

There yet remains a difficulty, for what cause the Nutritious Juice, being confused with the Blood, is not assimilated, but degenerates into an Heterogeneous, and Fermentative Matter: I suppose this to be done, for the most part, not by the default of the Aliments, nor yet of the Bowels, but by the vice of the Blood it self. For the Blood, even as Wine, sometimes passes from its native and genuine disposition, into an acid, sour, or austere disposition; and because the Blood makes Blood; it comes to pass, that when it is departed from its due temper, it easily perverts the provision of the Nutritious Juice, by which it should be repaired. What that disposition of the Blood is, and by what means contracted, shall be told hereafter, when we speak of the kinds of Intermitting Feavers, and of their evident, and Procatartick Causes. The Heat, or Effervescency therefore of the Blood, which constitutes the fit of an Intermitting Fever, depends only upon the assimilation of the nourishing Juice being hindered; the Particles of this being commixed with the Blood, are not (as before) ripened, nor are made into perfect Blood; but by the mixture of these, the mass of Blood (as it were new Drink) is imbued with little bodies greatly Fermentative; when the which are more thickly heaped together, and the Blood is filled with them to a swelling up, it presently grows hot, and a mighty agitation, and strife of the Particles is made, by which, they break, and subtilise one another, till at length the Vital Spirit getting the dominion, and the rest being brought under, what is extraneous is thrust forth of dores, from the company of which, the Blood being freed, the remission, and intermission of the aguish fit follows; but afterwards from a new supply of this Juice, a new fit is brought on.

Secondly, As to the shaking, or cold preceding the heat, in this Distemper, I say, when the Particles of the nourishing Juice, do proceed from a state of crudity, towards maturity, but do not attain it, they contract a notable sourishness; with which they greatly prick, and haul the nervous parts, and cause the sense of cold: even as new Beer, which being stopped close in Bottles, passes from a sweet into an acid and nitrous taste, that for the cuttingness and cold, can scarce be swallowed. When therefore, the Particles of this sort of crude Juice, being indued with a Nitrous sourness, do fill the mass of the Blood to a fulness, or to a swelling up, and when they being more thickly heaped together, begin to enter into a Flux, they first of all strike down the Vital Spirits, with their sharpness, and somewhat overthrow their heat; wherefore the Blood becomes colder, and is more slowly circulated: yea, and by reason of the defect of heat, the sense of cold is perceived in the whole body, and a pulse very rare exists. Moreover, When the nervous and solid parts, are watered with this sort of acetous Juice, for their last nourishment, by the Flux of this, which happens together with the turgescency of the Blood, these sensible parts are pulled, and irritated into Tremblings, and Convulsions. And this, without doubt, is the true and genuine Cause of the cold and shaking; which are excited in a fit of the Intermitting Fever; to wit, the Flux, and swelling up of the nourishing Juice, degenerated into a Nitrous Matter, with which the Spirits and heat being suffused, are blunted, and the Nervous Bodies, being provoked, are moved into Tremblings. But afterwards, when these Nitrous Particles being thrust forth, from some part, into the Superficies of the body, the Blood is somewhat freed from their weight and oppression, the Vital Spirits recollect themselves, and begin to shine forth; but from thence a most intense heat succeeds; because, both the mass of Blood, by reason of the growing hot with the Feaverish Matter, being loosened, and also its mixture being lax, the Sulphureous Particles are more plentifully inkindled in the Heart; and because (the Pores of the Skin, being possessed by the same Matter, thrust forth towards the circumference of the body) the vaporous *Effluvia* are restrained within, which do more shake, and make hot the Blood; that heat persists still in the Blood, until that Fermentative Matter being wholly burnt out, and together with the adust recrements, remaining after the burning, being fully brought under, and subtilised, and involved with the *Serum*, insensibly evaporates by sweat, or transpiration.

Thirdly, These things being premised, it will not be hard to shew the Reasons and Causes of the Intermission, as also of the set Periods, *viz.* the Intermission follows, because all the Morbific Matter is dispersed in one fit, and so till new be substituted, there is a necessity that a remission follow. But new Matter begins to be begot, of which the last fit failed; to wit, the mass of Blood being now emptied, receives the nourishing Juice, and perverts it (as before) by reason of its defect of due making of Blood, and of Concoction, into a Fermentative Matter; but its little plenty stirs up little or no trouble, or Fermentation; but when the Blood is filled to a swelling up, it presently Ferments, and is in Flux, even as when new Beer, or new Wine, shut up a long while in a Vessel, at length, at a certain time, boils up, and leaps forth at the mouth of the Vessel.

But that the Fits, or Accessions, do for the most part come again, at set intervals of times, and that so certainly, that a Clock is not more exact; the reason is, because the nourishable Juice, is for

for the most part supplied from the Viscera, to the Blood flowing in the Vessels, in an equal measure and manner; for though we do not daily take exactly so much meat and drink in weight and dimension, yet, because we for the most part eat at set hours,* for the satisfying the Appetite, from the things eaten, and the mass of the Chyme heaped up in the Bowels, an equal portion of the nutritious Juice is conveyed to the Blood through the Milky Vessels; wherefore, if at such hours, so much of the nutritious humor is poured into the Blood, which encreasing to a fulness, and swelling up, it brings on the Fit that day: certainly, this being finished, in the space of the same time, sufficient matter is laid up, for the following fit: But if Errors in feeding be committed, and that the sick indulging their Appetite, eat more plentifully or inordinately, the approach of the fit anticipates the wonted hour, by reason of the Bloods being filled sooner with the Feaverish Matter; if that the sick are abstemious, and more sparingly take their food, the intermission is drawn out longer.

If it be yet asked, wherefore the periods of intermitting Feavers be not of one kind, and of the same distance, but that some repeat, and come again daily, others on the third and fourth day? The cause is the diverse constitution of the Blood, to wit, whereby it is perverted from its due temper, now into a fowrish, now into an acid or sharp,; or into an austere or harsh disposition. By reason of the diverse evil constitution of this, the alible Juice, being fresh carried, departs more or less from maturation, and is perverted into matter, apt sooner or later to ferment. When the Blood has acquired a fowr, hot, and bilous disposition, I suppose that some part of the nourishing Juice is ripened into perfect humor, and is assimilated with the Blood, and so goes into food, to be carried to the solid parts, and is affixed to them; but the other part of it, from the Blood being too much cocted, and depraved, is changed into a feaverish matter, and supposing that half of the nutritious Juice is after this manner perverted, in double the time, in which it is said to have a full concoction in our Body (that is, after eight and forty hours) this kind of fermentative matter rises to a plenitude and turgescency, and then induces the fit of a Tertian Feaver. If that, by reason of the austere, and pontic nature of the degenerated Blood (in which a fixed Salt, with an earthy *Faces* is exalted too much) and therefore apt to ferment more slowly, only a third part of the nutritious Juice is corrupted, then in three times the space of the aforesaid time, the fit is induced; that is, after seventy two hours, in which, the period of a Quartan is wont to be concluded. But, if by reason of a greater infection of the Blood, almost the whole supplement of the nutritious Juice is perverted into a Feaverish matter; then in the space of that time, in which the plenary coction ought to be absolved in the Vessels and habit of the body (that is, after twenty four hours) this matter arises up to the motion of turgescency, and brings on the quotidian fit. And hence it comes to pass, that in a Quartan Feaver, strength and courage do not presently fail, whilst in a Tertian, the sick are wont to become more weak; but in a Quotidian Feaver, they are sooner brought into languishing, and greatest weakness: to wit, in each, as more or less of the nutritious Juice goes into the food of the Disease, so much also is drawn away from the strength and firmness of the Body: But more fully of these, when we treat of the several kinds of Intermittent Feavers, and the Causes of them.

Against the equal Circuits of these Feavers, it is argued, that for the most part, the fits do anticipate the set time of the day, by the space of some hours, and sometimes also come after it. But in truth this Objection is taken away, if the times of Intermision be computed, not by days, but by hours; for so the intervals which but now seemed to be now sooner, now longer protracted, will appear for the most part equal, by this Rule; forasmuch as in respect of the day, it is said a Tertian Feaver, sometimes prevents the wonted time of its accession, two, three, or more hours, or comes after it; in the mean time, every Circuit exactly repeats or comes again, every time after so many hours. Wherefore the chief differences of Intermittent Feavers consists in this only, that the time of the accession in one Feaver, comes more swiftly, and in another more slowly, *viz.* now at twenty four hours distance, now at thirty four, now at seventy, or the like.

From what hath been said (unless I am deceived) it clearly appears, what the Effervescency of the Blood is, which constitutes the fit of an Intermittent Feaver, from whence the fore-runners of cold and shaking, and lastly, what may be the reason of the Intermision, and of the set periods. But that these, and many other Appearances of this Distemper, depend upon the evil disposition of the Blood, and because of the depravation of the nutritious Juice, and not from humor, lurking in some Mine, will yet more manifestly appear from the collation of the Signs and Symptoms, which are to be met with, worthy of note, in this Distemper: then secondly, from the Procatartic, or more remote causes being truly weighed, which are wont to induce this Distemper: And thirdly, and lastly, from the ways of the Crisis, and Cures, by which this Disease either ceases of its own accord, or is driven away, by the help of Medicines.

First, Among the Signs, the Pulse and Urine deserve the chief consideration: The Pulse, the cold fit coming on, is very rare and low; which clearly argues, the Heat, and Vital Spirits

in the Blood, to be as it were overwhelmed by some crude matter, not easily combustible; just as a fire enkindled on the Hearth, and then covered with green wood, glows very slowly, and flames forth very little, which afterwards, the crude humor being blown away, breaks forth into an open and very strong flame; so also, the Blood, the crude matter, which is in Flux, being something overcome or dispersed, is very much enkindled; and what remains in the Blood is burnt up, when fermenting with the Particles of it, and induces a most violent heat, with thirst; wherefore the Blood growing impetuously hot, is urged with a vehement, and most swift Pulse; otherwise it being too much heaped together in the Heart, might cause the danger of choaking.

As to the Urine; that is imbued (especially, in a Tertian Fever,) with a deep colour, and as it were enflamed, also when the contents are wanting; which seems to denote a scorching of the Blood, and too adust temper: moreover, in this Distemper, different from others, the Urine, for the most part is ill, when the Patient is pretty well, and on the contrary; forasmuch as all the time of the Intermission, it is at a great distance from its natural state, it becomes filled with a red colour, and thick, being exposed to the cold, and lays down a plentiful sediment, like to Bole-Armoniack; which is of necessity to be so done, because in the whole interval of the remission, the Feaverish matter is circulated with the Blood, and there rises to maturity, with a secret increase. But in the middle of the fit, when the heat and burning are at the greatest, the Urine is laudable, and comes more near to the natural, *viz.* the fermentative matter, being sent to the circumference of the Body.

The Symptoms preceding the fit, confirm the same thing; for many hours before the fit begins, a perturbation of the humors, and blood, is perceived; an Head-ach, Vertigo, sparkling of the Eyes, unquiet Sleep, &c. which plainly shew the Blood first infected with the fermenting matter, and the assault of the fit to be only so long deferred, until the mass of the Blood is filled to a swelling up, with the same kind of matter: the fore-runners of the approach of the fit, are, now a paleness at the ends of the Fingers, or Toes, or in the Nails, sometimes a convulsion or numbness; now a coldness, and pain in the Loins and Thighs, and sometimes a shivering and trembling invade the Body, which clearly shew, the Blood in the Arteries and Veins, and also the thin Liquor in the Nervous parts, first to conceive the motion of Fermentation, and this Effervency not to be excited from any other Fire-place, or Mine. If it be objected, that the sick are most often infested with Vomiting, about the time of the fit; from whence it may seem to be concluded, that the chiefest hurtful matter is established in the Ventricle, and in the first passages, especially when this Distemper is chiefly cured, by the timely taking of a Vomit; I confess, very great Vomiting is sometimes stirred up in the fit of an Intermitting Fever; but this more often happens, because in the Feaverish shivering, the membranes of the whole body are pulled; wherefore the Ventricle also, as it is a very Nervous part, is distempered with a Convulsion, and having from thence contracted a Spasm, casts forth upwards whatsoever lurks in its bosom. Besides, if that the choler-bearing Vessels swell up with Bile or Choler, by the same Convulsion also of the Viscera, the Bile is pressed forth into the Duodenum by the gallish passage, and is emptied into the Ventricle, and there by its fierceness, provokes yet to a more cruel vomiting, wherefore for the most part, the vomiting which is excited for this reason, follows the shaking only. But that the Choler was not in the Stomach before the fit troubled it, but only pressed forth from the Choleduct passage, by the Spasm and convulsive motions of the Viscera, and poured forth into the Ventricle, appears from hence, because if a Vomit be given in the midst of the interval, between the two fits, little or nothing of bilious matter will be drawn forth; besides this bitter humor is of that fierceness, that it cannot be long contained in the Ventricle, but presently it will procure the pain of the Heart, and Vomiting. Besides this sort of Vomiting, excited in the shaking fit, sometimes a Vomiting is provoked in the midst of the burning fit, or in the sweat, the cause of which is the redundancy of the bilious humor in the Blood, of which if there be greater plenty, than what diluted with Serum may be sent forth by Sweat, a great part of it, whilst the Blood is circulated about the Crevices of the Liver, is laid aside in the Choleduct Vessels; which, when being filled to a distention, exonerate themselves, and send away the Choler to the Intestines and Ventricle, and there a Convulsion being presently stirred up, sometimes Vomiting is provoked, and sometimes the belly becomes loose, and the Stools liquid. In this Year 1657. I observed very many affected Intermitting Fever generally raged, the sick were wont suddenly to grow very ill, in the middle of their hot fit, and sometimes also in their Sweating, and the Sweat being struck in, to be taken with Swooning; but shortly after, when a Choleric Vomiting followed, they were eased.

Not only the signs and symptoms, but the Procatartic or more remote Causes of this Disease, clearly indicate, that it takes its rise from the temper of the Blood being changed; because Intermitting Fevers are most frequent in the season, and places, in which the Blood receives the greatest alteration from the Air, *viz.* either in the Spring, when the Vernal heat shutting out the Winters Cold, causes the Blood, before benumbed, and apt to be more slowly moved, to begin

to flourish, and luxuriate in the Vessels, and from thence, to get a bilous and hot temper: or in the Autumn, when the Blood being torrifed, or roasted by the Summers heat, and therefore its Spirits very much depressed, and Salt and Sulphur exalted, acquires now a sharp and Choleric, now a binding and austere disposition; wherefore, at this season, Feavers, now Tertian, now Quartan, are frequent; besides, in some places, there is that constitution of the Heaven, that on all men whatsoever, there comes either a Tertian or (more frequently) a Quartan Fever; although in the first Offices, where the Mine of the Disease is commonly believed to be lodged, there be no congestion of humors, by reason of an ill manner of living, or sickly disposition. Yea, they most easily fall into this Disease, who have their Inwards firm and strong, and who abound with a lively heat: on the contrary, those who by reason of a weak concoction, heap up Crudities in the first passages continually, that they are prone to the Dropsie, or Cachexia, remain free, for the most part, from this Distemper, to wit, the Blood being made more watery, (like Wine degenerated into a tasteless substance) is altogether unapt to be fermented.

No less doth the Cure of Intermittent Feavers seem to prove this our Assertion, whether it be Natural and Critical, or Artificial, and performed by the help of Medecines. As to the first, Intermittent Feavers are wont to be terminated after a twofold manner. The first is, when from the fits themselves the temper of the Blood is altered, and oft-times is reduced into its natural disposition. For when in every coming of the fit, very much of Sulphur, and adust Salt is burnt out, and exhaled by Sweat, the Liquor of the Blood, by that means becomes more temperate, and less torrid: wherefore, oftentimes this Disease is cured, at six or seven periods, and of its own accord ceases; but if it be longer protracted, and that the Blood being somewhat changed from the sharp and bilous temper or disposition, is not restored to its natural temper, sometimes it degenerates into an acid, watery, and also pontic or saltish temper, from whence a long Tertian Fever passes into a Quotidian, or a Quartan; also oftentimes, because the Blood is greatly depraved, by the long continuance of this Fever, the Jaundies, or the Scurvy, or the Cachexia follow. The other manner, whereby this Disease is terminated, is, when the change of the Air, or the Country, brings a notable alteration of the Blood; for so Feavers begun at the times of the Equinoxes, are ended about the time of the Solstices; also the sick, travelling into another Region, often grow well.

As to the Cure of it, by the Institutions of the Medecines, it uses to be done two ways, *viz.* Empirically, and Dogmatically; and in this Disease, Empirical Remedies, sought from Quack-salvers, and old Women, are more esteemed, and oftentimes do more than the Prescriptions of Physicians, administered after the exact method of Curing.

Empirical Remedies, which are said to cure Intermittent Feavers or Agues, are of that sort, which drive away the approaching fit, without any Evacuation, and are either taken inwardly, or are outwardly applied, where the Pulses chiefly beat, *viz.* For the most part, they are bound either to the region of the Heart, or to the Hand-wrists, or to the Soles of the Feet; these sometimes are so commonly known to help, that some have warranted the sudden Cure of this Disease, by these Remedies, under the pain of some forfeiture: Wherefore it is worth our enquiry, how these operate, and by what way or means they stop the Feaverish accessions. It is clear, First, that those which are outwardly applied, do immediately impart force and action to the Blood and Spirits; and when they drive away the fit, by preventing, without the evacuation of humor, or any matter of necessity, the reason of this effect consists only in this, that by the use of these sort of Medecines, the turgescency or swelling up of the Blood, with the feaverish matter, and Fermentation are stopp'd; to wit, from the Medecine tied about the Body, certain little Bodies or *Effluvia* are communicated to the Blood, which do very much fix and bind together the particles of it, or also, as it were precipitate them, by fusing and shaking them; and by either way, the spontaneous growing hot of the Blood, is hindred; as when cold water is put into a boiling Pot, or as when Vinegar, or Alum is flung into new and working Beer, presently Fermentation ceases. and the Liquor acquires a new taste and consistency, whereby it becomes fit to be drunk, as if it had been kept to ripen along time. But that these Ague-stoppers do work after this manner, it is plainly seen, because those which are of principal note, do excel in a Styptic, and binding force, or else with a precipitating virtue; hence Sea-salt, Nitre, Sal-gemma, the Juice of Plantane, Shepherds-burse, any binding herbs pounded with Vinegar, and the like, bound to the wrists, the root of Yarrow, Tormentil, also Camphire hung about the neck, are said to take away this Disease: yea, those also which are taken inwardly, are of the same rank; the Juice of Plantan, Red-Rose water, Alum, for that they fix, and constrain the Blood, a decoction of Piper, Sal Armoniac, or of Wormwood, Spirit of Vitriol, also a sudden passion of anger, or fear, forasmuch as they precipitate the Blood, by fusing and shaking it, do oftentimes hinder the Agues approach: even as the concussion, and shaking much any Liquor, or the infusion of astringent things into it, hinder its spontaneous effervescency and rage. It is usual with some Empiricks, for the cure of Agues, to tie a little knot in a Linnen Rag, or a piece of Paper rolled up, so strictly to the wrists, pressing hard upon the beating of the Pulse, that the circulation of the Blood is somewhat hindred, and by this means, the Aguish fit coming on, is driven

driven away. Very many by this way, I have known to be cured of a tedious sickness; the reason of which seems to be, that whilst the Blood is hindered from its motion in any part, it grows more tumultuous in the other parts; and so by this perturbation, stirred up in the whole Blood, the spontaneous Effervency of the Liquor, being about to follow, is hindered. But that the fit, by this, or any other means, being once hindered, does not afterwards easily return, the reason is, because, if this feaverish and depraved matter be contained longer in the Blood, it is afterwards cocted, and in some measure ripened; and therefore the Blood does not (as before) altogether pervert, either this, or the provision coming to it anew, but begins to digest and assimilate it; besides, when the fit is once stopp'd, its custom is broke, by the instinct of which alone, Nature oftentimes repeats those her Errors: for, as when it has once made a fault, it is wont more readily to do ill after the same way; so when it once omits its fault, it more easily accustoms it self to do better.

The dogmatical Cure is instituted for the most part, by Vomitory and Purging Medicines, also with the letting of Blood; with which the sick are miserably tormented, and the Disease seldom profligated or driven away, that deservedly, this Distemper is called the Shame of Physicians; but Tertian Feavers are sometimes carried away by a Vomit given just before the coming of the fit, which indeed happens (as I think) for the reason before mentioned. For I have said, That the cause of a Tertian Fever, is an evil disposition of the Blood, whereby it passes into a sower and bilious Nature; and therefore it doth not rightly assimilate the nutritious Juice brought to it, but changes it into a fermentative Matter; wherefore, if the Bile or Choler be copiously drawn forth of the Blood, that Choleric and hot Intemperance is very much taken away, and that fermentative power ceases of it self; But Emetick Medicines do chiefly perform this; for if they operate strongly, a Convulsion is not only brought to the bottom of the Ventricle, but also the *Duodenum*, with an inverse motion, is drawn together towards the Pylorus, and the Choler by a continual thrusting forward, being squeez'd forth from the Choleduct passage, is poured into the Ventricle, which is presently cast out by Vomit; which being copiously performed, the gallish Bladder is almost emptied, and after that, it becomes a receptacle, that draws forth, and separates the bilious humor, or the Particles of adust Sulphur and Salt plentifully poured into the Blood; the next fit sometimes is by this means prevented, not because the Mine of the Disease is extirpated by Vomit, but because an Evacuation and Motion is excited, contrary to the Feaverish motion, and for that reason, the spontaneous Effervescency of the Blood is prevented. Also by this means, sometimes the Disease is taken away after the Fit, because this way, the Blood is fully cleared from the bilious humor. It is worthy observation, that in a Quartan Fever, Vomits profit nothing, and seldom in a Tertian, unless administered presently at the beginning, whilst the Feaverish disposition is yet light, and not fully confirmed.

Concerning Intermitting Feavers in general, there yet remain some Irregulars of them, to be explicated, which vary from the wonted manner: for unless these unusual appearances be solved, this our Hypothesis will seem to be defective, and to halt in one part. First therefore, they are wont sometimes to lack the cold or shaking fit. This intermitting Fever is frequent in Autumn, whose fits are wont to exercise the sick only with heat. and that most violent, and in many they come with great Vomiting, but no Sweat or Cold; then after four or five periods, upon the coming on of the fit, the sick are wont to be chill, and presently after to quake, and in the declination to sweat: The reason of this was, because, from the very hot Summer, the constitution of the Blood was become sharp, and very much burnt; wherefore the Particles of the crude Juice, being commixed with it, were presently torrifed, or made hot, and scorched; that they did not at first, like (new Beer) grow hot with an Acrimony, and then afterwards blaze forth; but a turgescency being stirred up (like dry wood laid upon a fire) presently took fire, and broke forth into flames; but afterwards, the Liquor of the Blood being fired by several fits, became less torrid, that the depraved alible Juice was not presently torrifed, but passed into a Nitrous matter, and fermenting with sharpness, which at first swelling up, induced the sense of Cold to the whole Body. When the cold fit was begun, for the most part Sweat concluded it: which indeed hapned, because the Blood being made more watery, is more easily resolved into vapour, with the Feaverish matter, even as a watery Liquor is more easily drawn forth by distillation, than what is Oily, or of a more thick consistency.

It often happens, in the declination of this Disease, when the Fits begin to lessen, that the sense of Cold and shaking, by little and little are diminished, and at length vanish, and the Fit only troubles the sick with a light burning: The reason of which is, because at this time, the Blood being somewhat restored towards its natural state, begins to concoct and ripen the crude Juice; so that a great part of it is assimilated: but some Excrements being heaped together in the Blood, bring forth as yet a light burning: but when the Feaverish Particles do not participate of the Nitrous Acrimony, the Fermentation of the Blood is induced without any shivering, by which, what was extraneous, burns forth, is either subdued, or carried forth of doors. Sometimes also, in the declination of this Disease, the Fits appear without any burning, only with

with a light cold: The reason of which is, because the Morbifick matter, being rather Nitrous than Sulphureous, when it is in Flux, does somewhat blunt the Natural Heat; and by that means is dissipated, and vanishes, without any great deflagration.

There is yet a great doubt concerning the intervals of the periods, which sometimes seem to be double in the same Fever, that the first Accession answers to the third, and either perhaps comes in the morning; and again the second to the fourth, and both happen in the Evening; and so forward: wherefore, the Fever bearing this figure, is wont to be named a double Tertian, or Quartan, of which it doth not easily appear, how they should be done, if the fits depend upon the evil disposition of the Blood, and from thence on a Congestion to a Turgescentcy of the depraved nourishing Juice: for which cause, they commonly affirm, that this double figure is stirred up, or draws its original from a double Nest, or Mine; but to me it seems most likely, that in this case, sometimes it happens for the Fever to be simple, and of one kind, also its types or figures to be alike, and all congruous one to another, but the error to arise, because the interstices of the periods, are not computed by hours, but days: For when as, the beginnings of the fits are distant one from another, not exactly twenty four hours, but either sixteen, or thirty hours, in a Quotidian; and in a Tertian, not forty eight, but forty, or fifty six, more or less, or thereabouts; it comes to pass, that every other fit, happens before, and the others after Noon. To which also may be added, that the different manner of eating, which the sick use very often, produces great inequalities of figures: that sometimes the fit is redoubled twice in a day, as I have often observed in Cachectical men, or full of ill humors, and living disorderly: but it doth not seldom happen, that Intermittent Fevers, repeat fits, which do neither observe the same distance, nor bear altogether the figure of the same mode. I have many times observed in a Quartan Fever, that besides the set comings or Accessions, returning on the fourth day, about the same hour; some wandering and uncertain fits, did infest the sick; that sometimes on the day preceding, the wonted fit, sometimes on that following it, another fit (tho' lighter) was excited anew, with Shivering, Heat, and Sweat, exactly like the figure of an Intermittent Fever; and nevertheless, the primary Accession returned at its accustomed time. This, for the most part, is wont to happen, either from Diet evilly instituted, chiefly from surfeit, and drinking of Wine; or else from Medicines wrongfully administered: The reason of which (unless I am deceived) consists in this: The Mass of Blood, being wont to be filled to a swelling up, with the Fermentative matter, at a set time, often, by reason of some errors in eating and drinking, heaps up more matter, than can be easily dissipated in one fit; and when it unequally Cooks the same Fermentative matter, it often happens, that it first shakes off its superfluous, or more thin part, as it were by a certain skirmish, in a more light fit, but dispels the more thick, (after the primary Accession) as yet remaining in the Blood, by a Feverish Fermentation arising anew. And when the fits, in an Intermittent Fever, redouble after this manner, either become more remis, for that the same matter in either, is only divided; and eventilated by two accessions. Besides, when this Fermentative Matter, or Nutritious Juice, depraved in its circulation, is continued, partly in the Arteries and Veins, with the Blood, and partly in the Nervous stock, and solid parts, it may happen, that both humors do not ferment at once, but a great part of one may be dispersed in one fit, and then a great part of the other, in another fit.

CHAP. IV.

Of the kinds of Intermittent Fevers; and first of a Tertian.

WE shall easily accommodate to our Hypothesis, delivered in the former Chapter, concerning the nature and beginning of Intermittent Fevers, all the Phænomena which belong to it, and the reasons of them. But as those which are of this sort, do not observe the same space of Intermision, or of return, and their figures, as to the appearances of their signs and symptoms, do not altogether happen after the same manner; therefore according to the diversities of these, and especially from the distance of the fits, the various species and differences of Intermittent Fevers, are assigned. The chiefest division of them is, into Tertian, Quotidian, and Quartan: We shall here remark the chief things worthy of note concerning each of them.

It is called a Tertian Fever, not which is accomplished at the distance of three days; but inclusively from the day in which one Fit begins, from thence the other returns on the third. In the mean time, if the Fits be sometimes longer, *viz.* protracted almost to twenty four hours, and the Remissions anticipated also by their accessions, or comings of the Fits, the space is often-times

times less by a night and a day. This Disease is commonly distinguished into exquisite and spurious; The exquisite or exact Tertian Fever is, which begins with a vehement shaking, to which succeeds a sharp and biting heat, which goes off in sweat, and its Fit is finished in twelve hours, and that the perfect intermission follows; In the spurious or bastard Tertian, the cold and heat are more remis, but the Fit is often extended beyond twelve hours, yea, often to eighteen or twenty. These differ as to the various disposition of the Blood, which is in the former more torrid and sharp; therefore perverts the alible Juice from Crudity, towards an adustion, wherefore a more vehement Effervescency is stirred up; but as the matter more equally burns forth, it is sooner finished. In the latter, besides the adustion, the Blood abounds with too much serous humidity, wherefore, the nourishing Juice degenerates into a Crude matter, and therefore less apt to be overcome, and to burn forth; wherefore, its Fit is gentler, and more unequal, but is not finished but in a longer space.

The Essence therefore of a Tertian Fever consists in this; That the Blood (like Beer brew'd with too high dry'd Mault) being too sharp, and torrid, does not rightly subdue, and ripen the alible Juice, which is taken in from crude things eaten, but very much perverts it into a nitrous, sulphureous matter; with which, when the mass of Blood is filled to a swelling up, like new Beer stopp'd up in Bottles, it conceives an heat: From the flux of this nitrous matter, which blunts the heat, and vital spirits, and pulls the nervous parts, first the cold, with shaking is excited; then the vital spirit getting strength again, this matter growing hot in the Blood, begins to be subdued, and inkindled in the heart; from whose deflagration, an intense heat is diffused through the whole body; then its reliques being separated, and involved with *serum*, are sent away by sweat.

This torrid Constitution of the Blood, consists in this; That 'tis impregnated more than it ought, with Particles of Sulphur and Salt; wherefore, the Procatartick Causes, which dispose to this Disease, are an hot and bilous temperament, a youthful age, hot diet, as an immoderate use of Wine and spiced Meats, but especially in the Spring, and autumnal seasons of the year, when the Blood (as all Vegetables) is apt to flower, and to ferment of its own accord. By reason of these occasions, the Liquor of the Blood, is wont to be thoroughly roasted, and to be changed into a cholerick temper: and when it departs from its natural Disposition, so much, that it perverts the nutritious Juice, into a matter plainly Fermentative, the beginning of this Fever is induced; which sometimes happens from this intemperance, being leisurely increased and brought to the height; but more frequently, an evident cause raises up this disposition into act, and we ascribe the origine of this Disease to some notable Accident. Wherefore, lying on the Ground, or taking cold after sweating, or transpiration being any ways hindred; also a Surfit, or a perturbation of the Stomach, from any thing inordinately eaten; and lastly, What things soever stir up an immoderate heat in the Blood, bring the lurking disposition of this Disease into act: for that, from every such occasion, the nutritious Juice, being heaped in the Blood, and somewhat depraved, conceives a Flux, and departing from the rest of the Blood, ferments with a nitrous sharpness, then being inkindled and shaken by the Spirit, and vital heat, it induces the Fit, with a very strong burning.

A Tertian Fever, is wont to be more frequent in the Spring, at which time, the Blood is livelier and richer, and therefore more fitted for this kind of Feaverish distemper. If this Fever being taken, be ended within a moderate time, 'tis commonly said to be a Medicine, rather than a Disease; which is partly true, because, by this means, the impurities of the Blood burn out, the obstructions of the Viscera are discharged, and in truth the whole Body is ventilated, so that 'tis wholly freed from every excrementitious matter, and the seminary of growing Diseases. But if this Disease be long protracted, it becomes the cause of many Sickneses, and of a long want of Health. For from hence the mass of the Blood is very much deprived of the vital Spirit, and (like Wine too much fermented) in a manner grows lifeless: wherefore the Jaundice, Scurvy, or Cachexia, follow this Fever, being long e'er it be cured. For by its frequent fits, the vital spirit very much evaporates, and because it is but little restored by things eaten, the Blood therefore becomes weaker, and almost without life: In the mean time, the particles of Salt and Sulphur, are carried forth more, and exalted; from whence, the Blood is made sharp, and salt, and so more unfit for Circulation and Transpiration.

Moreover, This Disease being long protracted, oftentimes changes its Figure, and from a Tertian Fever, becomes either a Quotidian, or sometimes a Quartan: then sometimes from either, it returns into a Tertian. The Reason of this is, the disposition of the Blood being variously changed: which at first being sharp, and bilous, had perverted the nutritious Juice, by that means, that it arise to a fulness of swelling up on the third day; afterwards, by the frequent Deflagration, becoming less sharp, or in truth more waterish, it grows far weaker as to its Constitution, so that it doth very little, or not at all assimilate the nourishable humor, and ripen it, and by that means, the increase of the Fermentative Matter is made sooner, and the Fits return daily: or else, the Blood from a sharp and bilous intemperance, (the constitution of the Heaven, or the Year, bringing on this alteration) is changed into an austere, or saltish,

and

and therefore more slowly perverts the nourishing Juice, and the increase of the Feaverish Matter, gathering together more slowly, it doth not conceive the Fits till on the fourth day: but if either, by the means of Physick or Dyet, the temper of the Blood is reduced from either Dyscrasie, towards a bilous, the periods also are altered, and they resume the figure of a Tertian.

Certain Symptoms are wont to come upon a Tertian Feaver, which are commonly esteemed for the Crisis of this Disease; and in truth sometimes, these appearing, the Distemper either clearly ceases, or begins to abate of its wonted fierceness. But these kind of signs, are chiefly these three, *viz.* The Erysipelas, or an Eruption of Pimples in the Lips, the Yellow Jaundice, and an Inflammation, or swelling suddenly excited, in this or that part of the Body: very often there happens after three or four Fits to the sick, little Ulcers with a crusty Scab, to break forth about the Lips, and altho' there be no coming away of any Matter, in all the Body beside, yet from hence they presage, that the Feaver is about to depart, which sometimes the event proves true. But indeed sometimes, I have observed, that the hoped for effect has not succeeded; but that the Feaver pertinaciously, and for a long while hath afflicted them, when their Lips have been broken out. But as to what respects this Symptom, it seems to arise, for that the Blood having got a more free Diaphoresis, it not only thrusts forth adours, the more thin and smoaky Recrements, but also the more thick; and when the same, in other parts more easily exhale through the more open Pores, they stick in their passage about the Lips, by reason of the skin being more strictly bound together; and because the vaporous matter abounds in particles of adust Salt, and Sulphur, being fixed in the skin, it there hinders Circulation, and therefore induces Pustles, and little Ulcers; perhaps the more hot breath, which is breathed forth from the mouth, and nostrils, may contribute something to this Distemper, forasmuch as it scorches, and burns the Blood, and Juices flowing thither: wherefore, it may be said, That this eruption of Pustles, denotes only a more full Diaphoresis in the whole, by which, the more thick, as well as the thin Recrements of the adust Blood, evaporate forth of pores. For I have known in some, from a Tertian Feaver, little welks like the small Pox to break out in their whole body, that if by this more plentiful Ventilation, as it were a purging, the Blood be so freed, that it recovers its pristine disposition, the Feaver is cured: But if (as sometimes it happens) some Recrements, tho' more thick, break forth, yet others stay within; and still cherish the Feaverish disposition, those little Uleers, argue only a greater taint of the Blood, and pertinacy of the Disease, therefore it may be observed, when that scabs break out in the lips, if the Feaver does not presently abate, that it will be more grievous and tedious for the future.

Sometimes the yellow Jaundice comes upon a Tertian Feaver, and cures it; (which *Hippocrates* has also taken notice of) the reason of which is, because, when the Blood has got a sharp or bilous disposition; that therefore it had perverted the alible Juice, and from thence had heaped together excrementitious matter, it is oftentimes freed by that Dyscrasie, when by a sudden Secretion, the recrements of adust Salt and Sulphur, are more plentiful purged forth. This the Choleduct Vessels being irritated by Physick, or of their own accord, and so pouring out plentifully the Bile, from the Blood, do often perform: because Vomiting, Purging, and especially a Diarrhea or Lask, very much conduce to the Cure of this Disease, yea sometimes, the Blood it self, putting forth of its own accord, thrusts forth the bilous recrements, at its off-scourings, and in the circulating puts them forth in the skin, and so inducing the yellow Jaundice, cures this Feaver.

When an Inflammation, (as sometimes 'tis wont) comes upon this Distemper, the Ague is commonly said to fall down into the part distempered with the Tumor. But that by such a breaking forth, this Disease is cured, 'tis no wonder; because the Blood by this means continually lays aside out of his bosom, the provision of the degenerate nutritious Juice, and transfers it to the distempered part; and therefore, the degenerate and fermentative matter in the mass of Blood, does not easily arise to a fulness of swelling up: wherefore, the Belly being perpetually loose, hath by degrees helped some, for that the Blood by this means, readily casts forth its burthen, now growing low, and not having a more full increase yielded to it: sometimes also, a Deafness suddenly arising, the Tertian Feaver has presently ceased, to wit, by reason of a continual translation of the Feaverish Matter, from the bosom of the Blood, into the head.

If that the Tertian Feaver, within a short time, neither by the free accord of Nature, declines by degrees, that it doth clearly cease within seven or ten periods, nor is cured by any of the aforesaid means, nor is removed by the help of Medicine, but that after ten or twelve fits, the sick are still grievously afflicted, it will be a very hard task to cure it: because the Blood, from the continual heaping of the Feaverish matter, and by the frequent burnings, becomes at length so depraved, that it concocts nothing truly for the nourishment of the body, and for the sustaining its strength; neither is it able to shake thoroughly out of its bosom, the impurities and excrements, whereby the Disease may make a Crisis or separation, but in truth, the same growing in strength every day, the Blood, besides its Dyscrasie or evil disposition, begins to be

hurt somewhat in its mixture ; wherefore, more frequent fits infest them, nor does a perfect Remission come between, but that the sick being very weak and languishing, are almost continually Feaverish, with thirst and heat : when it is come to this pass, unless they are succour'd by remedies from Art, or that the change of the Place, and Air, bring timely help, this Disease often ends in death.

As to its Cure: the method of healing is commonly directed to this one scope, to wit, that the mine of the Disease may be extirpated, and that the Feaverish matter may be eradicated out of our Body, without any cherisher remaining, or fear of relapsing ; wherefore Vomits and Purges are diligently instituted, which when profiting nothing to the cure, but that the Patients strength is very much broken, the sick are left by the Physicians, and the business is wholly committed to Nature. The Intentions (as it seems to me) ought to be of this sort : First, a restitution of the Blood, to its natural Temper. Secondly, a prevention of the depravation of the nourishing Juice, as much as may be. Thirdly, an Inhibition of the Feaverish Fermentation, that the fit may not be excited. And these Indications take place, not only in a Tertian Feaver, but in any other intermitting Feaver besides : which yet are to be performed, not by the same ways and remedies, but by several, according to the diversity of the Disease, of the condition of the sick, and of the symptoms chiefly urging. However in the curing of this Disease, there is more to be attributed to Nature, and to a good order of Diet, or way of Living, than to Physick.

1. Concerning the first Intention ; to wit, that the Blood may be reduced to its natural Temper, Vomits, letting of Blood, and Purging are of great use : especially, if they be celebrated in the beginning of the Disease. *Vomitories* help, both for that they purge the Ventricle, that the first Concoction may be better performed, and by that means the nourishing Chyme may be more purely supplied, for matter of the Blood ; but chiefly, for that by plentifully pressing forth the Bile, from the Choleduct passage, they empty the Gallish bag, as by that means, the Bile is poured forth more full from the mass of Blood ; and so the Blood is purified, from the recrements of adust Salt and Sulphur. The opening of a Vein, cools and ventilates the Blood, as by that means, 'tis less torried, or scorched, and is circulated more freely in the Vessels, without danger of burning. Also Purging plentifully draws forth, and by provoking expresses, or squeezes out, the Bile, from the gallish Vessels, and consequently from the mass of Blood. For this end, (to wit, the reduction of the Blood) Digestives bring help, the more temperate Vinegars, or Acetous things, forasmuch as they fuse, and alter the Blood, and do attemper its fervor. Sometimes also, the change of the Soil, and Air, notably amends the evil constitution of the Blood, before all other Remedies whatsoever.

The second Intention, is excellently performed, by Diet, and an exact manner of living ; which in this Disease ought to be slender and sparing : wherefore it is commonly said, Starving is the best Remedy for this Disease : and it appears by common experience, that by a more spare eating, the coming of the Ague fit, is very often prolonged, beyond its wonted custom. There are especially two things to be observed, concerning Eating and Drinking : The first, that the food be slender, that nothing Sulphureous or Spirituous be given, for so the Conflagration of the Blood will be lessened ; then secondly, that the fit approaching, or urging, nothing of Aliment be taken, wherefore, in fasting the fit is lighter, and sooner finished.

As to the third thing proposed ; the Inhibition of the Feaverish fit, is instituted by Remedies, which stay the Fermentation of the Blood. But tho' this Remedy seems Empirical, and unmethodical, and very failable to Physicians, yet I have found these Feavers to be very often cured by this means, when Medicines have profited nothing : What they are, and by what means, without the suspicion of Witchcraft, they afford help ; for the curing this Disease, is before noted. We shall here only advertise you, that the use of these is most profitable after Physick, and opening a Vein, if there be need of it ; and unless these be rightly performed before-hand, those other rarely stop the fit. But Vomiting, Purging, and breathing a Vein, unless they be presently celebrated after the beginning, yield little help, yea, more often are wont to hinder : For whilst the Blood is strong in vital spirit, its evil disposition, may with easie labour be corrected, or amended : wherefore if the Bile, about the beginning, be copiously drawn forth, or the Blood eventilated, it is reduced to its natural Complexion ; but afterwards, in the progress of this Disease (the Spirit being now very much exhausted, and the Salt and Sulphur too much exalted) if these kind of Evacuations be administred, they do more debilitate the disposition of the Blood : and therefore it is clear by observation, that the Tertian Feaver, is rarely or never cured, by these Remedies late administred, and often passes into a Quotidian. I my self have known some, in the Spring time, being strong in very good health, from a more strong Emetick taken for prevention sake, causing a violence by the Evacuation, to have presently fallen into a Tertian Feaver ; and others, for some time cured of this Feaver, when they had taken a strong Purge, for the carrying away of the remains of the Feaverish matter, upon it to have fallen into a Relapse. It may be readily said, that the mine of the Disease, being before at quiet, was stirred up, and brought into Act, after this manner by the Medicine : But if you consider this thing rightly,

rightly, it may rather be said, that from the strong Medicine, the disposition of the Blood was very much hurt, and when at first it was prone to a bilous Dyscrasie, that it hardly did assimilate the alible Juice, from this evident cause, it forthwith degenerated, that it wholly perverted the Nutriment, into a Fermentative matter, and so conceived the Feaverish disposition. It is a common opinion, that a Tertian Feaver can scarce be cured, without a Vomit, wherefore some Medicaſters, are wont under the pretext of the neceſſity, to give to all whatſoever, labouring with this diſeaſe (though languiſhing and weak) an Emetick Medecine not without great danger of life : and thoſe whom they judge wholly unfit for ſuch a Medecine, they leave as not eaſily curable, to Nature. But (as I have often found the contrary by experience) this ſort of practice is evilly inſtituted ; yea, I rather judge, for the curing of a Tertian Feaver, that Vomits are rarely or never to be required, unleſs in a ſtrong Body, and very eaſily prone to vomiting, and when the Ventricle happens to be burdened with excrementitious matter ; but inſtead of it, that a gentle Purge, by which the load of the humors may be pleaſantly brought away, may be of better uſe ; becauſe a Purge in this caſe, doth the ſame thing as a Vomit, to wit, it evacuates the Choleduct Veſſels, that the Bile being plentifully exhausted from the Blood, the Feaveriſh Dyscrasie is mended. But when the galliſh humor, being emptied forth into the Ventricle, is caſt out upwards, from thence there is great hurt brought to the Stomach, and a mighty perturbation excited in the whole Body : But if that humor be enticed downwards by a gentle Purge, it is ſent forth of doors without any trouble. Then, if to a gentle Purge, once or twice repeated, be added a very ſlender Diet, without fleſh, it often answers the preſervatory Indication, that there needs no other Remedies, for the taking away the cauſe of this Diſeaſe ; but that theſe being rightly performed, ſhall render beneficial thoſe things, which being either inwardly taken, or outwardly applied, ſtop the Feaveriſh acceſſion. By this ſort of plain and eaſie inſtitution of Medicine, *viz.* A Purge of the infuſion of Senna, and Rhubarb, a ſlender Diet, and a Febrifuge or Ague-reſiſting Topick, laid either to the Wrists, or the Breaſt, I have known vey often, and in a very ſhort time, Tertian Feavers cured, without the uſe of any other deſtroying Phyſick ; yea, a thin Diet only, with Amulets timely adminiſtred, hath very happily cured Big-belli'd women, and alſo very weak old men, whoſe ſtrength could not bear Purging. I have ſo often made trial of this method, with good ſucceſs, that I doubt not, but that a Tertian Feaver may as eaſily be cured, as any other Diſeaſe, if it be at the beginning handled after this manner, *viz.* before the temper of the Blood be more hurt, by an evil manner of Diet, or by Medicine untowardly adminiſtred. For the truth of this thing I will relate this following Hiſtory.

A certain Noble young man, indued with a bilous temper, had caught an intermitting Tertian Feaver ; upon the approach of the Fit, he vomited forth much yellow and greeniſh Choler, then he was troubled moſt grievouſly, for many hours, with a great pain of the Heart, and moſt ſtrong Heat and Thirſt. On the day of the Intermiſſion there was taken from this perſon, with whom I was by chance, by my preſcription, eight ounces of Blood, and in the Afternoon was given an Emollient Clyſter, he alſo uſed a moſt ſlender Diet (*viz.* only made of Barly) He took every night going to ſleep, this Opiate, *viz.* Conſerve of Roſes vitriolated, half a dram, of Diaſcordium a ſcruple, alſo every morning of the Salt of Wormwood a ſcruple, in a ſpoonful of the Juice of Orange ; but when theſe did not ſucceed (for the fit returned ſomewhat more remiſs, but with cruel Vomiting, as at firſt,) beſides, for that this ſick perſon extreamly abhorred a Vomitory Medecine (becauſe not long before this, from a very gentle Emetick, he had vomited almoſt thirty times, until being diſtempered with the Cramp and Convulſions, he was brought into great weakneſs, with hazard of his Life) therefore, the day following the aforeſaid Fit, I gave him a Potion of an infuſion of Senna, Rhubarb, and yellow Sanders, with Sa't of Wormwood, in Spring-water, by which he was purged ten times with eaſe : In the Morning after, and three hours before he expected the Fit, I put to his wrists an Ague-reſiſting Medecine, and took from him ſix ounces of Blood, by which means he miſt his Feaveriſh Fit, and then being again purged after the ſame manner, became perfectly well.

If that the Tertian Feaver, by reaſon of the evil Conſtitution of the ſick, or becauſe of Errors in Diet, or committed by Phyſick, hath more deeply rooted it ſelf, that after a long Sickneſs, the Fits ſtill grow worſe, and the ſick extreamly languiſh, with want of Strength, Thirſt, and almoſt continual Heat, want of Appetite, Wakings, weak Pulſe, high coloured Urine, and very full of Contents, the Curatory Method ought to be a little otherwiſe inſtituted ; In this caſe, firſt it is to be endeavoured, that the Dyscrasie of the Blood may be taken away ; wherefore the ſick are to be fed with ſlender Aliments only, as Barly-Broth, or Grewel, with opening Roots boiled in it (fleſh-Broth being wholly laid aſide) the Belly is to be kept looſe (if need be) with the uſe of emollient Clyſters, beſides (Purges being omitted) only Diſſeſtive Medecines, which ſuſe the Blood, and bring away gently the ſerous Impurities by Urine, alſo comforting Remedies, which corroborate the Viſcera, and cheriſh the Spirits, are chiefly to be inſiſted on. To this end, Apozems are fitly to be prepared, of Herbs, and Roots gently Diuretic ; alſo Opiats help very much, of temperate Conſerves, with Sal Nitre, or

the fixed Salt of Herbs, with shelly Powders, and the Spirit of Vitriol mixed together. When the disposition of the Blood is somewhat mended, that the Urine is clearer, and less coloured, also sleep quieter, with a remission of thirst, and heat following, then may be profitably administered Remedies to stop the Feaverish Fit: wherefore Ague-resisting Amulets may be applied to the Wrists or to the Soles of the Feet; also the Powder of Peruvian Bark, or of something instead of it, or also of the Barks of the Ash-Tree, Tamarisk, or Gentian, with Salts mixed with them, and drunk in white Wine; after the comings of the Fits are taken away, and the sick begin to get strength, and desire food, and in some measure to digest it, gentle Purges may be of use; but let the sick still abstain from a more plentiful Diet, or participating of Flesh, and they will shortly after recover perfect Health without any violent Purge or Phlebotomy.

C H A P. V.

Of the Quotidian Intermitting Feaver.

BEcause of its Affinity to the Tertian Feaver, and likeness of Fits, the Quotidian (or daily) Feaver comes next, viz. whose Accession is wont to return every day. It is the Opinion of some, that this sort of Feaver is only a double Tertian, and doth arise from a dispersed matter, having gotten a twofold Nest; to which I cannot assent; and I suppose its beginning is to be attributed to a peculiar Dyscrasie of the Blood. In this the Symptoms of Cold and Heat are more remiss, but its fit is longer continued, and oftentimes it is wont to last eighteen or twenty hours: This Feaver for the most part follows a Tertian; for when the Vital Spirit is very much flown away, by the frequent deflagration of the Blood, and (the Feaverish disposition still remaining) the Blood is made weaker, it doth not concoct the nourishing Juice, or ripen it, but perverts almost the whole into a fermentative matter; wherefore its comes sooner to its increase, and is gathered together to a plenitude of swelling up, within double the time, than at first. But because the congested matter participates equally of crudity and adustion, therefore the heat of the burning is lesser, and more unequal, and (like green wood laid on the fire) slowly burns; for which reason the Fit endures longer.

Sometimes it happens, that a Quotidian Feaver, doth arise without a Tertian going before, viz. when a Feaverish disposition falls upon a Cacochymic Body, or full of evil humors, and stuffed with depraved Juices; for then the Blood, being poor in Spirits, perverts in a greater measure the nutritious Juice, and in a shorter time gathers to a fulness of swelling up: But that which begins an everydays Ague, oftentimes changes its figure, and becomes a Tertian; just as a Tertian often goes into a Quotidian, because between these Feavers, and their Causes, there is a great vicinity; and the constitution of the Blood being a little changed, it makes a transition from one to another. A Quotidian Intermitting Feaver is not so easily cured as a Tertian: For whether it comes at first simple, or follows upon another intermitting Feaver, it is still excited from a stronger cause, and argues a greater dyscrasie of the Blood, which will not presently give way to Remedies. But also, if this Feaver be of long continuance, or comes upon another Chronical Disease, it has most often adjoined to it, besides the taint of the Blood, the infirmities of the Inwards: to wit, the Blood being spoiled, easily affixeth its impurities by degrees heaped up, on the Viscera, whilst it passes through their Meanders: from hence it is, that in a Quotidian Feaver, the weight of the Ventricle, an extension of the Hyponchondria, Obstructions, or Tumors, now of the Liver, now of the Spleen, or Mesentery, are joyned together; but these kind of Distempers, are not the cause of the Feaver (as is commonly believed) but only its product. Wherefore, in this Feaver, besides the simple method of Cure, which is shewn in the Tertian, many other intentions or coincications, come under consideration: to wit, that the Ventricle be cleansed from its load of humors, the stuffings of the Inwards freed, Infirmities corroborated; and that together with these, the Dyscrasie of the Blood may be mended, and the Accessions of the Feaver may be restrained, must by all means be endeavoured; from whence, by reason of these kind of various intentions, we come to the Cure by a longer way: In this case, Vomits (if strength will bear them) are of benefit before all other Medicines: also Purges, whereby the assiduous supply of Excrementitious matter may be drawn forth, are often to be repeated: Besides these, Digestive Remedies, Openers of Obstructions, such as restore the Ferment of the Viscera and Blood, and correct their evil dispositions, are frequently to be administered. Wherefore, the fixed Salts of Herbs, and their Extracts, Acid Spirits of Minerals, and sometimes Preparations of Steel, do very much help: concerning these

main things, the Task will be hard, whenby reason of the manifold evil, many things are to be done together, yet by reason of the assiduity of the Feaverish fit, there is leisure for the sick to use few only. In Distempers so complicated, though the reason of the Method requires the impediments to be first removed, and then to cure the Disease, yet I have known this kind of Feaver, beset with many other Distempers, in a Body full of Humors, often cured, without Method, and by an Empirical way, *viz.* after a light provision of the whole, Ague-resisting Remedies being outwardly applied, have at first stopped the Feaverish Fit, that then there was time, for the curing the other Distempers, and more happy occasions of healing were granted. I lately visited a Noble Lady, who being long indued with a Cachectical habit of Body, a Month after her Lying in, being weak and languishing, was taken with a Quotidian Intermitting Feaver; after six or seven fits of it, her strength was so much cast down, that she could scarce rise out of, or sit up in her Bed; nor able to take never so little Food, though very slender, but upon it, most grievous molestations were raised up in her Stomach; besides, the Region of her Ventricle, and left Hypochondrium, was wholly beset, with a hard shining tumor, and cruelly painful, by reason of her strength being mightily cast down, there was no place left for Evacuation, but the use of Clysters; also her Stomach being very weak, loathed all other Remedies, unless very grateful, and only in a very small quantity. In this difficult case, circumscribed between narrow limits of Curing, I counselled these few things, to wit, that twice in day, she should take this mixture, *viz.* The Magisterial Water of Earth-worms two ounces, of Elixir Proprietatis twelve drops. Moreover, I ordered to be applied to her Ventricle, a Fomentation, of the Leaves of Sea-Wormwood, Centaury, Southernwood, with the Roots of Gentian, boiled in White-Wine, in an open Vessel: also, that after the Fomentation, a Cake of Toasted Bread, and dipped in the same Liquor, should be worn upon her Stomach; besides, Ague-resisting Medicines were ordered for her wrists; and with these Remedies only, she mist her Ague-Fit, on the third day, and remained free from it afterwards; then by the Use of Chalybeate Remedies, she became perfectly well, within a short time.

CHAP. VI.

Of a Quartan Feaver.

IN a Quartan Feaver, the period is longer than in the rest; to wit, which is extended to the fourth day inclusively; also its continuance uses to be longer, and its cure harder: because this Disease is protracted for many Months, yea, oftentimes for years, and seldom, or scarce at all, is cured by Medecines.

The Fit, for the most part, begins with cold and shaking, to which a very troublesome heat succeeds, but more remiss than in a Tertian: Sweat for the most part concludes the Fit. At the first coming of the Disease, the Fits are more grievous, and very infestous, and keep the sick in their Beds; yea, they make them lose their strength, and vigor of Body: But afterwards, the trouble is more easily born, so that the fits are suffered out of bed, and sometimes in a Journey, or being about any business. If it continue long, it induces the Scurvy, or Hypochondriac Distemper, and involves men in an unhealthful condition.

The Causes which dispose to this Disease, are first, the Constitution of the Soil and Air, because this Distemper is proper to the Fall of the Leaf, or Autumn, that you rarely find this Feaver to begin but about that time: also in some places, especially about the Sea-coasts, this uses to be general, or common to the Region, and to come upon those living there, or Strangers coming thither from elsewhere. A declining Age, which is past its Achme or height, also a Melancholick Temper, and which, by reason of an ill manner of living, is obnoxious to the Hypochondriac Distemper; cause this: besides, long Feavers of another kind, and Chronical Diseases, often pass into a Quartan Feaver.

According to these Positions, and rightly weighed, it may be said, that a Quartan Feaver, even as the other intermitting Feavers, depends upon a vicious disposition of the Blood; to wit, because the nutritious Juice, being by degrees dilated into the Vessels, is perverted into a fermentative matter; and the effervescency of this, heaped up even to fulness of swelling over, constitutes the Fit of the Quartan Feaver. But as in this Feaver, there are some things, which are peculiar from the rest, we will enquire what kind of Dyscrasie of the Blood it is in this Disease, distinct from the others, and by what means it excites the very remarkable Symptoms.

The Opinion which is commonly had concerning this thing, is very far from Truth ; almost by the consent of all, the Essence and beginning of a Quartan Fever, is ascribed to a Melancholic humor, heaped up somewhere in the first passages, and there periodically putrifying. Instead of this, we affirm, that in this Disease, the Liquor of the Blood doth pass from a sweet, spirituous, and balsamick, into an acid, and somewhat austere nature, like Wine growing sour; to wit, there is too great a want of Spirits, and the Terrestrial, or Tartareous part of the Blood (which consists chiefly of Salt and Earth) is too much exalted, and being carried forth into a Flux, induces the sourness of the mass of Blood. Even as Beer being disturbed by Thunder, and infected with a troubled Lee or Dregs, grow sour. The Blood, after this manner degenerated from its native disposition, doth not rightly dress the alible Juice, and assimilate it to it self, but perverts it into an extraneous matter ; with which, when it is satisfied to a fulness, in the Vessels, and the nervous parts are watered by the Juice, from thence arising, a Flux of this matter, and as it were a spontaneous effervescency follows, by which indeed, the Feaverish fit is induced, with shivering and heat, as is wont to be in a Tertian.

In a Quartan Fever, the periods have longer intervals, because, when the Dyscrasie of the Blood is become sourish, and therefore less violent and hot, it perverts the alible Juice without strife or tumult : wherefore, it assimilates some of it, and the depravation of the rest, does not so far recede from its natural state, as in a Tertian ; and from hence its congestion to a plentitude, is made longer, and almost in another half of that time, in which a Tertian rises up to a Turgescency : And therefore, those taken with this Fever, are indifferently well, and are strong ; which is a sign, that the nutritious Juice is less depraved ; also the Fits are made without cruel burning, because the nutritious humor is perverted into a fermentative matter, without great adustion.

But why this Disease is so hard to be cured, and so pertinaciously infests the sick, the cause is, the Melancholic Constitution of the Blood, which is not easily to be taken away, and yields almost to no Remedies. The Cholerick disposition of the Blood is mended by the frequent Desflagation, and ceases often of its own accord, even as too rich Wines are depressed by their own growing hot, and are wont to be reduced into their due state ; but this Melancholick Dyscrasie of the Blood, in which, with a want and defect of Spirits, Salt and Earth are too much exalted (as when Wines grow sour) is most hard to be restored, and is almost of the same labour and difficulty, as to put again Life, and a Vinous Spirit into Vinegar : For that the Blood, depraved after this manner, may be restored, it will be needful, that its whole mass should be volatilized, and as it were made Spiritual anew : wherefore, in this case, Evacuations profit not a jot ; yea, by more depauperating the Blood, oftentimes the strength is cast down, beyond help ; but they had need to exalt, and make volatile what is fixed, and to promote a Transpiration, or Spiritualization in the whole Mass of Blood : From hence it is, that in this Disease, the change of the Air and Region, most often brings help, before all other Remedies ; for the Spring following oftentimes takes away those Quartan Fevers that had arisen the Autumn before ; which without doubt happens, because the changed condition of the Air is wont to alter for the better, the evil disposition of the Blood : also for the same reason, the change of the place, most often cures this Distemper, inexpugnable to all Physick.

If it be demanded, wherefore this Disease chiefly begins in the Autumn, and rarely in the Spring, or Summer time ; I say, the Autumnal time doth most fitly produce this kind of Feaverish disposition of the Blood ; for when very much of the Spirit and Sulphur hath flown away by the Summers heat, and that what is left begins to be bound up by the Cold ; the Liquor of the Blood (as Wine growing sour by too much heat) easily degenerates into a saltish, and acidulous or sharp Nature : This also, the Sea-Air, by infecting the Blood and Spirits with Saline Vapours falling on them, easily procures : yea, also the affinity of this Disease, with the Scurvy and Hypochondriac Distemper, plainly shews, the evil disposition of the Blood to be in fault, whereby it becomes salt, and earthy, with the want of Spirit.

Concerning Quartan Fevers, the last year was so abundantly fruitful of Observations, that many might collect by ocular inspection, whatever belong to this Disease ; for when the most hot Summer was past, about the end of it an Epidemical Fever (of which in another place you shall have a description) followed ; then the Autumn coming on, when that Disease had ceased, a Quartan Fever began very much to rage ; that in very many places the fourth part of the People was taken with it : neither did it only infest old men, splenetick and melancholick men, but of every Age and Temper, also Infants, Children, and young Men ordinarily ; which was clearly a sign, that this Distemper had drawn its Rise, not from a Melancholick Humor, heaped up, by the default of the Spleen, but from the Dyscrasie of the Blood, brought in, through the immoderate effervescencies, was made fit to grow somewhat sour, or to get an austere disposition, and so also prone to this sort of Fever, as is already shewn.

If the Remedies, which for the curing of this, have been made trial of, both by Physicians and Empiricks, were collected together, their description would swell into a great Volume ; but

but although there is instituted a manifold provision of Medecine, against this Evil, yet very few are cured in the Autumn. In some, about the beginning of their sickness, before the Disease has taken too deep root, a Vomit hath brought help; but in most, all manner of Catharticks, tho' an hundred times repeated, have profited nothing. In whom the evil had deeply implanted it self, the sick received no help, from the most studied Medicines made use of all the Autumn. But when at this time, I perceived the ordinary method of Medicine, was administered in vain, I proposed to a Noble Virgin, requiring a sudden Cure, by any means, to be performed, that if she would induce a Flux at the Mouth, for some days, from a Mineral Medicine, by that means, it might be hoped, that the Disease would be profligated. When she had readily assented to this, I gave her a gentle, and very safe Medicine, by which a light spitting only was provoked, and that finished within twelve days: As soon as the Salivation began, she mist her fits, but at those times they were wont to come, she felt a perturbation in her whole Body, with an oppression of the Heart, and dread of swooning, but after the spitting was finished, she appear'd very well; and when again after two months space, she was troubled with some light fits of this Disease, from an Emetick Powder, twice or thrice taken, she was wholly cured without relapsing.

After the winter Solstice, this Disease began to rage less, and to cease in some of its own accord, and in many others, to be easily expung'd by the use of Physick: because at this time, the Dyscrasie of the Blood, contracted by the Summers heat, is wont to be blotted out leisurely, by reason of the cold of the Winter, and the mass of Blood growing old, as it were to put off its old spoils, and to be reduced towards its natural state. But those who were of a melancholick temper, or had their Viscera, and especially the Spleen, evilly affected, or that used an ill manner of Diet, received no change at this Tropick, but to the next period of the year, viz. to the vernal Equinox, or the Spring, kept the Disease; and then in most, the Blood being either restored of it self, or its intemperance more easily mended by the use of Remedies, this Distemper was seen to be overcome: But in the mean time, many old men, and such as were full of evil humors, or otherways unhealthy, ordinarily died, in all that space of time, of this Disease; also some liv'd, who could not shake off its yolk, tho' the Summer Solstice were past. But altho' very many had labour'd with this Fever, as it were Epidemical, almost through the whole year, yet none (that I know) contracted it first in the Spring, and very few grew well of it during the Autumn, that in truth, I do not doubt, the Dyscrasie of the Blood, to be the cause of this, and the cure to consist in the change of it.

The Remedies, which most often brought help, (as appeared at least to our observation) were of this sort, which did restrain the Feaverish fit: for the evils of the disposition of the Blood, being somewhat mended, by the time of the year, being changed, if now the habitual custom of the fits were broken off, Nature recollected her self, and easily recover'd the pristine state of health, by her own endeavour. And this kind of intention, (to wit, the inhibition of the fits) though sometimes performed by Vomits, given a little before the coming of the fit, (for these did not rarely stop the Feaverish motion of the Blood, by raising up another motion contrary to this) yet this Indication is far more certainly, and indeed happily effected, by the use of those kind of Medicines, which do not altogether evacuate from the Viscera, but induce, either a certain fixation to the Blood, or a precipitation of the Feaverish matter, for a time. Wherefore, those whom I undertook to cure in the Spring, and afterwards; I handled (and in most with good success) with this method; a provision being made of the whole, sometimes with an Emetic Medicine, sometimes with a Solutive; I was wont three hours before the fit, to lay a peculiar Ague-Medicine to the wrists, and together, to give them to drink in Sack, an Ague-resisting Powder, and to order the sick to be kept in a Bed in a gentle sweat: It seldom hapned, but at the first, or second time, the Feaverish fit, was by this means restrained, and then, by the same Remedy, sometimes reiterated, the Disease at last wholly ceased. To this kind of practice, (besides our experience) the use of the Powder, of a certain Bark, brought of late from the *Indies*, seems to give some faith, and approbation; which is said, most certainly, to cure this Disease; but the vertue, or operation of this, without any evacuation, consists in this only, that it hinders the coming of the Feaverish fits.

Concerning this Peruvian Bark, because of late it hath begun to be in use, there are some things to be said, which offer themselves to common observation. The common manner of exhibiting this is, that two drams of it beaten to powder, be infused in Sack, or White-wine, in an open Glass, for two hours, and then upon the coming of the fit, the Patient being put to Bed, that the Liquor and Powder be drunk up. This Potion often takes away the approaching fit, yet oftentimes tho' taken after the wonted manner, it prevents the next, however, either in the first, second, or third period, the fit is inhibited, and the Disease seems to be cured, it is often wont to return, within twenty or thirty days; then this Powder being again exhibited, the Disease is for a time deferred about the same space, and by this means, I have known many sick of a Quartan, to have suffered some few fits only, a whole Autumn, and Winter, and so to have detained the enemy in his precincts, till the Spring coming on, the disposition of the Blood is altered for the better,

better, by the help of the time of year, and of other Physick, and so this distemper vanishes by degrees. Those who by this means, have procured these frequent truces of the Quartan, have liv'd chearful, lively, and ready for any business, when otherwise, being weak, and pale, they were brought into languishment, and a vitious habit of body: scarce one of an hundred, hath tryed this Medicine in vain, yea, if but half, or a lesser quantity, viz. the weight of but one dram, taken, it very often takes away the fits, and suspends the same, a shorter space only; neither is it any matter, whether it be taken in strong, or small Wine, unless with the respect, to the disposition of the sick: because in a more hot temper, it may be profitably taken in distilled Water, or Whey; also, a clear infusion of it, the more thick substance being cast away, produces the like effect, but of shorter durance: I have taken care to reduce this Powder into Pills, with the Mucilage of Tragacanth, with a little cost to the sick, to be given to some; after what manner soever it is taken, unless to those loathing and abhorring every Medicine, it causes no manifest evacuation, and takes away the fit, almost from all; neither is it only in a Quartan Fever, but in the other kinds of intermitting Fevers, to wit, in every one where there is any remission coming between, given with good success. It is commonly ordered, that a gentle Purge should be taken before this, but in some who are very weak, and keep their Beds, this Powder being taken carefully, without any previous Medicine, hath procured laudable effects. In the mean time, I will ingeniously confess, that I have not seen an intermitting Fever quite cured, by this Bark, once taken: nay, rather the fits not only of a Quartan, but of a Tertian, and Quotidian Fever, wholly overcome easily by other Remedies, seeming to be driven away by this Powder, have constantly return'd after a short time. For this Reason, they who suppress intermitting Fevers, otherways easily curable, no necessity urging them, by this Medicine, for a little while, only seem to institute a deceitful Medicine, and do no more than those, who skin over a rotten Ulcer, which will shortly break out again; in truth, in some cases, the use of this will be requisite, viz. when by the too great assiduity of the fits, the spirits of the sick are cast down, truces are by this means procured, by which Nature may recollect her self, and afterwards may be more able to fight against this potent Enemy: also, that a Quartan Fever, during the Autumn and Winter, may pass over with little trouble, this Bark is profitably administred: But those, who expect a longer resting time, from the assaults of this Fever, are bid to take this Powder in greater quantity, and more often, to wit, that they should take two drams, three several times one after another, whether the fits return or no; by this means, they remain longer free, yet they retain within, the Enemy still, tho' asleep.

If it be demanded, concerning the Nature of this Bark, and the vertue in suppressing the fits of Intermitting Fevers, it is not to be dissembled, that 'tis very difficult to explicate the causes of these kind of effects, and the manner of working; because there is not found as yet in any Subject, besides, the like efficacy; but from a singular Experiment, a general Reason is not to be rightly fitted: however, from the appearances diligently Collated, we will deduce some Theses in order, which may make at least some steps towards, if not obtain the verity of this thing.

It is to be noted therefore, in the first place, that this Medicine, being inwardly taken, especially exerciseth its force and energy on the Mass of Blood: because, it does not at all irritate the Viscera, neither causes in them any excretion, or trouble; besides, whilst it communicates its vertue to the Blood, it doth not at all put forth Anti-feaverish property; wherefore, not always the next following fit, but the second, or the third, is prevented, by the same being taken: and for this reason, that it may sooner affect the Blood, it is a usual thing, to drink the Liquor, very much impregnated with the same Powder, for so its Particles are more easily conveyed into the Mass of Blood. Secondly, The Vertue of this Bark, being impressed on the Blood, stays in it for some time, and that either shorter or longer, according as either a greater or lesser portion of the Medicine was taken inwardly; for the Particles of this, being confused with the Blood, are a long while circulated with it, and by how much the longer they stay, by so much the more they affect its mass, and produce a longer effect: for though Aliments, and some other things taken in, for that they are presently overcome by the native heat, put off whatever they have of vertue, within some few hours, this being then assimilated, or sent forth adooors, they cease to operate: yet some Medicines being taken inwardly, because they are not easily tamed, nor cast forth of doors presently, by an irritation stirred up, they remain for many days very active, and hold a long time the Juices, and the Blood, in this or that manner of Fermentation, this may be observed of some Medicines, also of Poysons, and Counter-poysons, the once or twice taking of which, for some days, is wont to affect our Bodies for a longer time; for 'tis an usual thing which Cathartick Medicines, when they work yea, if Death be avoided, from the drinking of Poyson, every body knows, that the virulency will lie hid, a long time in the Blood and Juices. In like manner also, this Powder, and perhaps very many other things inwardly taken, altho' they seem asleep, yet continue to act, on the Spirits and Humors.

Thirdly, Altho' this Medicine acts immediately on the Blood and Humors, yet it takes not wholly away, the Feaverish Dyscrasie, implanted in them: for, as soon as its force is consumed, and all its Particles are flown away, from the mixture of the Blood, the Distemper being only suppressed for a time, at length rises up, and repeats its fits after its wonted manner, but forasmuch as Nature, by the space of this cessation, becomes stronger, therefore, after the Relapse, the fits (not as Before) but on the third or fourth day, according to the first figure of the Disease, are wont to return.

Fourthly, It is remarked, that this Remedy, does not stop the Feaverish accessions, as the ordinary Ague-resisters or Febrifuges, by fixing, or also by fusing the Blood; for then the next fit always, and not the second, or third following after, is prevented.

According to which positions, that we may instead of a Corollary, subjoyn some things concerning the manner it self of working, whereby this Medicine seems to act; we say, it is most likely, that when the Particles, proceeding from the same being taken, are thoroughly mixed with the Blood, they compel it into a certain new Fermentation, by which, whilst the Particles of the Blood are continually agitated, they are wholly hindred, that they cannot heap up any Excrementitious matter, or enter into Feaverish turgescencies; for, as after the biting of a mad Dog, or stinging of any venomous Creatures, the Blood it self, and nervous Juice, are a long while impoysoned, yet lest they should conceive presently great irregularities, Counter-poysons being taken do hinder their Liquors, by retaining them in another Fermentation; the use of which, if so long continued, whilst the virulent little Bodies are quite flown away, no horrid symptom is to be feared, from that evil being contracted; but if the strength of the Remedy, being too sparingly given, be first consumed, forthwith the Venom repululates, and the old Poyson, thought to have been exploded, is at length brought into act: by the same way, when the Blood, having gotten a vitious disposition, perverts the Alible Juice, and whereby it might more rightly expel it, heaped together to a fulness, conceives Feaverish swellings up; this Peruvian Bark being beaten, and administred, by the Commerce of its Particles, so agitates the Blood, tho' distempered with an evil disposition, with a new excited Fermentation, and alters it, that it in some measure concocts the nourishable Juice, and continually evaporates its Recrements, that they are not heaped together as before, into the matter of a fit: But, when the Particles of this Remedy, are wholly flown away, from the company of the Blood, and the whole virtue consumed, the evil disposition of the Blood, before contracted, at length rises up, and so the Feaverish fits return, after their wonted manner. Sometimes perhaps it happens, that whilst the Feaverish fits are suppressed, by the use of this Powder, by reason of the season of the Year being changed, or by the help of another Remedy, or by the endeavour of Nature it self, that Dyscrasie of the Blood may be mended, by degrees, and so the Feaver may at length vanish, of its own accord. This I have known to happen, but very rarely, because almost with the same certainty, by which you expect the Feaverish fits to be suppressed, by that Powder, you may afterwards look for their return.

As to what appertains to the sensible qualities, with which this Bark is noted, it appears to abound with bitterness, and a certain stipticity, that it seems to the taste, to have the likeness of Savor, which is in most Counter-poysons, as the Root of Gentian, Serpentry, Contrayerva, &c. for what are bitter in act, are strong in excellent virtue, for the suppressing the force of preternatural Ferments; yea, the Root of Gentian, which is likest to this Bark, was in times past of famous use, for the Curing of Quartan Feavers. But now, altho' this Peruvian Powder, be the only Alexiterion or Counter-poyson, as yet found out against a Quartan Feaver, to wit, that inhibits (tho' only for a time) its fits, and of other Intermitting Feavers, yet it is not to be doubted, but that there are in the World, other Medicines extant, which are as good Ague-resisters; and it is hoped, that led by the example of this new invention, we may be excited, to the finding out the virtues of Herbs, almost as yet unknown: so, which whilst we shall insist on the trial of several, and the Empirical be joyned to the Rational Medicine, without doubt the Cures of the Quartan Ague, and of other invincible Diseases, may more happily be accomplished: which therefore I promise more willingly to this Age, or at least to the next, when being led by the Analogy of this Book, I have found out a Medicine, for the profligating of Feavers, of use not contemptible, it not being long since variously tryed, which also I am wont to give to the poorer sort, instead of something else, with good success.

CHAP. VII.

Of Continual Feavers.

A Continual Feaver is that; whose fit is continued for many days, without intermission: It hath its times of remission, and of more fierceness, but never of intermission; the burning is now more remiss, now more intense, but still the sick are in a Feaver, until by the temperament, or insensible growing well, the Disease is wholly cured. Concerning this, it behoves us to inquire, what Effervescency of the Blood it is, which causes a continual Feaver; then, by what ways, and from what causes, it is wont to be excited: also, how it differs from that, which is in Intermitting Feavers. And these being performed, we will descend to the Species of Continual Feavers.

There are many ways, by which the Blood growing hot, induces a continual Feaver, the chief of which may be reduced to these Heads: The first way is, when the more spirituous, and subtil Portion of the Blood, becomes too hot, and is disordered, with a certain burning, which therefore agitates the other parts of the Blood, and incites it into a certain rage, so that the Sulphur, or the Oily part of the Blood, is more dissolved, and more inkindled in the Heart, also, for that cause, there is among all the Particles of the Blood, a certain syncrasis, contrariety, or perturbation, by which in truth, being confused, and put out of order, they are not able quickly to be extricated, and reduced into their former posture, wherefore a heat and burning more than is wont to be, is stirred up in the whole Body: but when the Spirits are only in fault, their heat and disorder, are wont within a short space, to be allayed of their own accord; therefore, this Feaver is often terminated within a day, and is rarely continued beyond three: and therefore, is called and Ephemera, or a Feaver of a day, or Synochus of more days.

2. The second manner, or degree of growing hot, is when the Sulphureous or Oily part of the Blood, being too much heated, conceives a Fervor: for then, it both grows immoderately hot in the Vessels, and being very much inkindled in the Heart, produces by its desagrati- on, a very strong heat in the whole Body. Indeed the Blood, as to its temper, mostly depends on the condition of the Sulphur; when by reason of Crudity, the Sulphur is less dissolved, the Blood is made watery and cold, and is moved slowly in the Vessels: but if the Sulphureous, or Oily part of the Blood, grows hot, beyond its Natural disposition, presently it becomes fierce, and improporionate with the rest, so that, almost the whole being acted, as it were into a flame, by the Ferment of the Heart, compels the mass of Blood to grow immoderately hot, and and to boil up. For as when Wines, indued with a rich Lee, are stirred up into an heat, by the too rancid Sulphur; or as Hay, laid up too wet, by reason of the want of Ventilation, conceives of its own accord a burning, the Particles of the Sulphur being loosened from the mixture; in like manner, when the Blood is not rightly ventilated, but being restrained from Evacuation, by reason of the admixtion of some hot thing, or a more plentiful sanguification, or for some other cause, the Particles of the Sulphur begin to be thickly gathered together; presently, all its Liquor, immoderately boils up, by the Sulphurs being loosened, and inflamed in the Heart, and this kind of Feaver is induced, which is called a putrid Synochus; notwithstanding which appellation, tho' of many rejected, for that the Blood so long as it is in motion, doth not putrify; yet forasmuch, as in this Feaver, the mixture of the Blood, is somewhat loosened, by the Sulphur being too much exalted, and the mass of its Liquor being changed, from its Natural disposition, tends toward putrefaction; therefore, the term of a putrid Feaver, as hath been anciently used, may be still, with good reason, retained.

3. The third degree of growing hot, (and which constitutes a distinct kind of continual Feaver) is excited, from a certain malignant, and invenomed Ferment, by which, when the mass of the Blood is imbued, and the Spirits, and the Sulphureous part together, conceive an heat, and their burning is not sooner appeased, than that either that malignant matter be consumed, and cast forth of doors, or else a certain coagulation, and as it were putrefaction, of the Blood from its corruptive venom is induced, by which, both circulation is hindered, and the Vital Spirit extinguished. This malignity is wont to arise, either from a certain contagion received from without, or from some infection begotten within us; according to these ways the malignant Feaver, Small Pox, Measles, and also the Plague, draw their beginnings, and by their contagion, far and near set upon many.

There are therefore three degrees, or manners of growing hot, by which, the kinds of continual Feavers are determined. From the subtil portion of the Blood made hot, or the Ebulli-
tion

tion of the Spirits, the Ephemera arises, as also the Synochus of one or more days; by the Sulphureous or Oily part of the blood, being too hot and inkindled, the putrid Feaver is stirred up; then thirdly, upon an envenomed taint, infecting the blood, and congealing its Liquor, malignant Feavers depend. In every one of these, by the depravation, or rather corruption of the alible Juice, fresh carried into the blood, the various fits, inequalities, and critical motions arise. But before I enter upon the several kinds of a continued Feaver, it is requisite for me, to consider, how the growing hot of the blood, in a continual Feaver, differs from that other, which constitutes intermitting Feavers.

I say therefore, that the growing hot of the blood, in an intermitting Feaver, depends only, upon the commixtion of acertain fermentative matter, and not rightly miscible, with the blood, and on its growing up, to a fulness of boiling over. Because of this heat, with the blood in the Vessels, and of the deflagration in the Heart, the fit is induced; because of its growing cool, the intermission follows, that in the coming between of the fits, neither the Spirits, nor Sulphur, become outrageous, but the bond of the mixture being kept whole, the Liquor is circulated in the Vessels, equally, and without trouble: on the contrary, in a continual Feaver, the disorders of the Spirits, and of Sulphur, of either, or both together, by their proper Ebullition, also without the mixture of any other, stir up the Ebullition of the blood; wherefore there are required, for an intermission, besides the diffation or cooling of the excrementitious matter, a deflagration of the enkindled blood, and a reduction of it to its due temper.

The Constitution of the blood in a continual Feaver, is of the same sort as of Wines, when they grow hot upon too rich a Lee; to wit, are mighty in Spirit, and grow turgid with exalted Sulphur, and therefore they conceive a fervor, and greatly boil up of their own accord, without the mixture of any other thing. In an intermitting Feaver, the blood is moved after that manner, as Wines, when they conceive an heat, because of something poured to them, that is not miscible with them: Moreover, in this Feaver, the disposition of the blood is of that sort, as of Wines, when in their decay and declination, they become ropy, unfavoury, or acid, to wit, in which the Spirit is depressed, that in the mean time, either Salt, or Sulphur, or both together, appear above the rest, and infect the whole Liquor with their disorder. An intermitting Feaver, for the most part is free from danger, because the constitutive parts of the blood, although they should somewhat change their disposition, however, keep the bond of mixture, and whilst they are in power, are circulated equally in the Vessels, yea, they pervert the nutritious Juice into a matter, not altogether besides Nature, but rather infesting, with its fulness and turgescency. In a continual Feaver, besides the intemperance, the mixture of the Blood, and constitution of the Liquor are somewhat loosned, and its corruption easily follows; wherefore this Disease often ends in death: further, the nourishing Juice is depraved into a matter wholly vicious, and altogether infestous to Nature.

CHAP. VIII.

Of the Ephemera, or Feaver for a Day.

I Have said, the least degree of heat, which induces a continual Feaver, is placed in the subtil, and spirituous part of the Blood, being too much agitated and heated; for this, like the Spirit of Wine, boils up on every light occasion, and conceives a fervor, by a too great motion of the Body, or perturbation of Mind, by the ambient heat, as of the Sun or Vapors, by hot things taken inwardly, as the drinking of Wine, and the eating of Pepper'd meats, and being irritated by such like. For the Spirits of the Blood easily take fire, and being impetuously moved, are not presently appeased, but they move throughly other Particles of the Blood, variously confound and snatch them into a rapid and disorderly motion; also from this motion of the Spirits, the Sulphur, or Oily part of the Blood is more boiled forth, somewhat more dissolved, and something more fully enkindled in the Heart, by which means, an intense heat is raised up, in the whole Body. But forasmuch as Sulphur is enkindled, and inflamed only by small parts, and not in the whole, that fervor of the Spirits is quickly appeased, and ceases; wherefore the Feaver which is excited by this means, for the most part is terminated within twenty four hours, and therefore is called an Ephemera, or a Feaver of a day. If that by reason of a greater heat of the Spirituous Blood, it is prolonged further, it rarely exceeds three days, and is called an Ephemera of more days, or a Synochus not putrid; but if it

should happen to be lengthened beyond this time, this Feaver easily passes into a putrid, *viz.* from the daily ebullition of the Spirituous Blood, the more thick particles of the Sulphur at length begin to take fire, and involve the whole Mass of Blood in its effervescency: even as the Spirit of Turpentine, being shut up in a Cucurbit, and being put into a Sand Furnace, if it be forced with a moderate heat, boils up gently, as the Blood in a Feaver of a day; but if the heat be made more strong, the Liquor grows impetuously hot, till it breaks forth into a flame, to which the inflammation of the Blood, in a putrid Feaver, may be very aptly compared.

The Days Feaver, and Synochus simple, rarely begin without an evident cause: Besides what hath been but now said, immoderate Labour, Watchings, a sudden passion of the mind, a constriction of the Pores, a Surfeit, also a Bubo or inflamed Sore, a Wound, the coming down of the Milk in Child-bearing Women, are wont to induce them: The procatartic Causes, which dispose to this, are an hot temper of Body, an active Habit, a sedentary Life, and disuse of exercise.

The chief beginnings of this Disease depend upon the presence of the evident Cause; for either, little Bodies of extraneous heat, being confused with the Blood, like water boiling over the fire, make it to boil up; or this Feaver is induced, by motion, or by reason of transpiration being stopped; even as Wines made hot by motion, or when too closely stopped in the Ton, are put into a fervor: but what way soever an inflammation is first excited, presently the Spirits become enraged, and being moved hither and thither, compel the Blood to boil up, and to be enlarged into a greater space, with a spumous rarefaction; wherefore the Vessels are distended, and the membranous parts halled; hence follow pain, chiefly in the Head and Loins, a spontaneous weariness, and as it were an inflation of the whole Body. If that, with the Spirit of the Blood, a certain sulphureous part be also in some measure inkindled, a sharp heat is diffused through the whole, the Pulse is vehement and quick, the Urine red, also thirst, watchings, and many other Symptoms infest, the Reasons of which are added hereafter.

Concerning the Solution, or Crisis of the Ephemeran Feaver, and of the not putrid Synochus, three things are chiefly requisite, *viz.* a removing of the evident cause; secondly, a separation, and a scattering of the depraved or excrementitious matter, from the mass of Blood: thirdly, a quieting of the parts of the Blood, and a restitution of them to their natural and equal motion and site. According as these succeed, now more suddenly, now more slowly and difficultly, this Disease is finished in a shorter or longer time.

1. The evident cause, which for the most part is intrinsic, is easily removed, and the sick are wont, presently to avoid the presence or assiduity of that thing, and do perceive a sense of any thing that is hurtful; none taking a Feaver from Wine, will still indulge the drinking of it, as soon as any one grows more than usually hot, in a Bath, or the heat of the Sun, 'tis a trouble to them to stay longer.

2. As to the excrementitious Matter, which ought to be scattered and separated from the Blood; this is either brought from without as when the Blood is infected by surfeit, drinking of Wine, sitting in the Sun, or from too hot a Bath, with *Effluvia*, or little dry and fermentative Bodies; or this matter is begotten within, as when its Liquor is stuffed with Recrements, or adust Particles, from the deflagration of the Blood. Either of these matters ought to be separated from the Blood, to be dispersed, and either by sweat, or insensible breathing forth, to be thrust out of doors, before the Feaver be appeased: wherefore, whenas the pores are bound up, and transpiration hindered, the Ephemeran Feaver is longer protracted, and sometimes passes, from a simple Synochus, into a putrid.

3. The evident Cause being removed, and this degenerate matter dispersed, there is required for the remission, a quieting, and reducing into order, the parts of the Blood; for divers Particles of the Blood; being after this manner confused; and by reason of the Feaverish heat carried up and down, they do not presently get again the former order of situation and position; but it is needful that they be by degrees extricated, and by little and little restored; to a just mixture.

Although this Disease, after the removing of the evident Cause, for the most part ceases of its own accord, within a while, yet some Medicinal Remedies may be administered with good success, especially, when there is danger, lest the Ephemeran Feaver, should pass into a putrid. The chief Intentions should be, to suppress the fervor of the Blood, and to procure a more free transpiration; to the which conduce, first, a breathing of a Vein, a slender Diet, or rather Abstinency, cooling Drinks, and a bringing away the filth of the belly, by Clysters: Sleep and rest greatly help, above all the rest; which, if wanting, should be procured in time, by Opiats, and Anodines.

Verily, although the Histories, and Observations of those, distempered with an Ephemeran Feaver, contain in themselves nothing very rare; yet I shall subjoin an example or two in this place, whereby the Delineation or Type of this Disease may be illustrated.

A certain young Gentleman, about twenty years of Age, endued with a strong habit of Body, by the immoderate drinking of strong Wine, fell into a Feaverish distemper, with thirst, heat, and with a great burning of his Præcordia; being let Blood, he drank a great quantity of fair water, and upon it presently a plentiful sweat following, he grew shortly well: In this case, the more thin portion of the Blood, being heated by the Spirits of Wine, fell into a rage, caused the whole Mass of Blood to be shaken, and its frame to be loosened more than 'twas wont; and for that reason, that hapned to be more dissolved, by the Ferment of the Heart, and to be as it were enkindled by the active Particles, loosened from the mixture; until the Vessels being emptied by Phlebotomy, the raging Blood was cooled, and by the drinking of the water, its fervor was attempered; then the hot *Effluvia* being involved, together with the adust Matter, with a copious *Serum*, and sent away by Sweat, the Blood at length recovered its due temper. Moreover an ingenious young man, of a sedentary life, and also very much addicted to the study of Learning, when he had for some time exercised himself beyond his strength, in the hot Sunshine, he began to complain of the pain of his head, a want of Appetite, a heat of his Præcordia, and of a Feaverish distemper all over; to whom (for that he was wholly averse to Physick) I ordered an abstinence from all things whatsoever, unless from small Beer and Grewel; on the second day, and so more on the third, the Symptoms remitted, by little and little; on the fourth, he went home freed from the Fever, without any Medecine.

C H A P. IX.

Of a Putrid Fever.

SO much for a Continual Fever, which is raised from the most simple heating of the Blood, or its lowest degree of inordinate heat; that which depends on a greater degree of heat follows, viz. when the Oily and Sulphureous part of the Blood, being too much heated, swells up above measure, and as it were forced into a flame; and therefore from the similitude, by which humid things putrifying, conceive an heat, this kind of Ebullition of the Blood, because it induces an immoderate heat, is called a putrid Fever: which Name ought to be retained without injury, because that in this Fever, the Synthesis of the Blood (as is wont to happen in putrefying Liquors) is very much unlocked. When the Spirits only grow enraged, (as in an Ephemera) the frame of the Blood is somewhat set open, and loosened, that it is more dissolved, by the Ferment of the Heart, than is wont, and more Particles than naturally use to do, leap forth, and diffuse a more intense heat; but yet the mixture of the Liquor, as to its chief parts, is conserved. But when the Sulphureous matter taking fire, grows hot above measure, the bond of the mixture, for the greatest part, is loosed, that its Principles are almost wholly drawn away, by the Ferment of the Heart, and the active Particles, being loosened from the mixture, break forth as it were into a flame. Wherefore, the Liquor of the Blood being after this manner rarified in the Heart, and as it were enkindled, is from thence carried through the Vessels, with a most rapid motion, and disperses very many *Effluvia* of heat, from its disintegration. Hence, the whole mass of Blood (like water put over the fire) continually, boiling, distends the Vessels, pulls the Brain and Nervous parts, raises up Convulsions, and pains in them, very much destroys the Vital Spirits with its heat, wastes the Ferments of the Bowels, hinders the Offices of Concoction and Dispensation, often depraves the nourishing Juice, destinated for the Nervous stock, that from thence exceeding great disorders of the Animal Spirits follow; yea almost perverts the whole œconomy of Nature.

The course of this Disease shews it self after this manner; It rarely begins without a procaccartic cause, or previous disposition: to wit, the Sulphureous or Oily part of the Blood, is first too much carried forth, and exalted beyond its due tenor, which afterwards, either of its own accord (like Hay not eventilated) begins to grow hot, or by the coming of an evident cause, it is forced into a preternatural heat. But when it grows turgid in the first place, by reason of the admixture of a crude Juice with the Blood, now a shivering, now heat infests, which shew themselves unequally, like Fire which is covered with green wood, sends forth now smoke, now flame: But at length, the fire glowing more largely, as here the victor fire spreads it self abroad, so there (sooner than said) the whole mass of Blood is inflamed, and is urged at once with heat, and a most swift motion; nor is this immoderate heat of the Blood appeased, before its active Particles being loosened from the mixture, and then successively inkindled in the Heart, are wholly burned out, which doth not happen, but in the space of many days. And then at length this Fever ceases, when the remaining Liquor of the Blood, the Spirit and Sulphur being very much consumed, being made lifeless and poor, is fit only for a weak and small

Fermentation. From this kind of deflagration of the Blood, and also of the alible Juice (by the same fire burnt out) the recrements, or little Bodies of torrif'd matter, are heaped up in the Blood, which yet do more promote its fervor and ebullition, and for a time increase the Feaverish distemper. After the blood hath very much burned forth, and these kind of little bodies are gathered together to a fulness of swelling up, the vital Spirit endeavors a separation, and tries to concoct, and to overcome (what it may) these adust recrements, and then, having put a great many of them into a swelling up, a Flux being risen, strives to shut them wholly out. And indeed, in the subaction and seclusion of this matter, chiefly consists the event of this Disease; for if the vital Spirit being strong, the bloody Humor (when it hath sufficiently burned forth, and shall be freed from these adust particles) should recover its pristine tenor, whereby it is made fit for motion, and a due fermentation in the heart, the sick tends towards health; but if by a long deflagration, and an inextricable confusion of the morbid matter, the liquor of the Blood, being wanting of Spirits, and more pure Sulphur, or those same (by the impure mixture growing ill) being as it were put under the yoke, is rendred so lifeless, that it is not any longer rarified by the ferment of the Heart, or enkindled, by degrees its heat and motion, together with Life it self decays.

The procatartick Causes, which dispose to this Disease, are, a hot and humid Temper, an active habit of Body, a youthful Age, the Spring time, or Summer season, a high and rich Diet, besides the often drinking of rich Wines, a sedentary and idle Life, a Body full of gross Humors, and stuffed with vicious Juices; but above all the rest, it appears by observation, that the frequent letting of Blood, renders men more apt to Feavers; wherefore it is commonly said, from whom blood is once drawn, that unless they do the same every year, they are prone to a Feaver. The reason of this is (unless I am deceived) by the frequent letting of blood, the Sulphur is more copiously gathered together in the Mass of blood; in the mean time, the Salt (which should bridle it, and hinder it from raging) by this means is drawn away; for the blood, the older it grows, becomes so much the more salt, the Salt of all the Elements not evaporating. But by how much the more the Blood abounds in Salt, by so much the less it abounds in Sulphur; for Salt eats and consumes the Sulphur, and makes it evaporate: wherefore they who are lean, and abound with a salt blood, are less prone to Feavers. But when by the letting of blood, the ancient blood is drawn forth, in its stead another more rich, and more impregnated with Sulphur, is substituted; so that it becomes less salt, and more sulphureous. Hence it is, that those who often let blood, are not only prone to Feavers, but also are wont to grow fat, because of the blood's being more impregnated with sulphureous Juice.

The evident Causes which deduce the latent disposition of this Feaver into act, are of the same sort; which procure an Ephemeran Feaver, and simple Synochus; in this rank chiefly come, Transpiration being hindered, and Surfetting. By reason of the *Effluvia* being restrained, the Mass of the blood being increased in bulk grows turgid, and conceives a Fervor, as it were from a certain Ferment, inspired anew, and cruelly boils up; from thence, presently the pores are more obstructed, by the infartion of the *Effluvia*, and the frame of the Liquor being loosned, the particles of the Sulphur exuberating in the blood, leap forth from the mixture, and are inflamed by the ferment of the Heart, as it were by fire put to them, and so they enkindle a very intense Feaver. But from a Surfeit, both an immoderate fermentation is induced in the blood, and also a nitrous sulphureous matter, apt for adustion, and an inkindling is conveyed, as it were food, to the burning blood.

In this Feaver, four times or seasons are to be observed, in which, as it were so many posts, or spaces, its course is performed: These are then, the Beginning, the Augmentation, the Height, and Declination. These are wont to be finished in some sooner, in others more slowly, or in a longer time. The beginning ought to be computed, from the time the blood begins to be made hot, and its Sulphur to conceive a burning, until the ardors and burnings are diffused, through the whole mass of blood. The Increase or Augmentation, is from the time, that the blood being made hot, and inkindled through the whole, burns forth for some time, and its mass is aggravated with the Recrements, or burnt Particles, which increase the fermentation. The state, or standing of the Disease, is, when (after the blood has sufficiently burned forth, and its burning now remits) the long vexed blood, like a noble Wrestler, when his Adversary is a little yielding, recollecting all his strength, endeavors a bringing under, and a separation of that adust matter, with which it is filled to a plenitude, and also a Crisis or separation being once or oftner attempted, an expulsion of it forth of doors. The Declination succeeds after the Crisis or Secretion, in which the blood grows less hot, with a languishing fire, and either (the vital Spirit being as yet strong) overcomes what is left of that adust and extraneous matter, and by degrees puts it forth, until it is restored to its former vigor; or, whilst the same Spirit is too much depressed, the Liquor of the blood is still stuffed with adust Recrements, and therefore becomes troubled and depauperated, that it neither assimilates the nourishing Juice, nor is made fit for an accension in the heart, for the sustaining the Lamp of Life.

1. When therefore any one is taken with a putrid Fever, the first assault is for the most part accompanied with a shivering or horror: for when the Blood begins to grow hot, there is a flux made, and a swelling up of the crude Juice, freshly gathered together in the Vessels, even as in the fit of an intermitting Fever, heat, and sometimes sweat follow, upon the shivering, by which, the matter of that crude Juice is inkindled, and dispersed: afterwards, a certain remission of the heat follows, but yet from the fire still glowing in the Blood, a lassitude, and perturbation with thirst, and waking, continually infest: A pain arises in the Head, or Loins, partly from the ebullition of the Blood, and partly from the motion of the nervous Juice being hindered; also a nauseousness, or a vomiting offends the Stomach, because the Bile, flowing out of the Choleduct Vessels, is poured into it, and a Convulsion from Vapors, and from the sharp Juice brought through the Arteries, is excited in the Stomach. In the mean time, altho' the heat be more increased, and unequal, it is not yet strong, because the Blood as yet abounding with crude Juices, is only inkindled by parts: and therefore burns out a little, and then ceases, and at last returns; like a flame that is made by wet and moist straw. In this condition for some days, the Disease remains, the Urin is more red than usual, by reason of the Salt and Sulphur being more dissolved and infected with the *serum*; It still retains its Hypostasis or substance, because the Coction and assimilation are not altogether depraved; it appears greater than ordinary in its sediment, which is yet easily separated, and falls to the bottom of its own accord. At this time, they may let Blood, and administer Physick by Vomit, or Purge, so it be done without any great perturbation of the Blood: it often happens, from these kinds of evacuations, timely performed, that a greater increase of the Disease is prevented, and the Fever as it were killed in the shell. The limits of this stadium or space, are variously determined, according to the temper of the sick, and other accidents of the Disease; sometimes, the first rudiments of this Fever, are laid in a day or two; sometimes the beginning of the Disease is extended to more; if in a corpulent Body full of Spirit, Juice, and hot Blood, or it happen in a youthful Age, and very hot season, if the disposition to a Fever be potent, and the evident cause coming thereupon be strong, the Feaverish heat, being once begun, quickly invades all the Blood, and on the second and third day, having rooted it self, the Disease arises to its increase; but if the Feaverish indisposition, be begun in a less hot Body, a Phlegmatic temper, or a melancholy, and in old age, or a cold season, the entrance is longer, and scarce exceeds the limits of this first stadium or space, before the sixth or seventh day.

2. The increase of this Disease, is computed from what time the burning of the Fever hath possessed the whole mass of Blood: that is, the Sulphur, or the Oily part of the Blood, having been long heated, and growing fervent in parts, at length, like Hay laid up wet, breaks forth, after a long heating, all at once into a flame; the Blood at this time cruelly boils up, and very much inkindled in the Heart, by its deflagration, diffuses as it were a fiery heat through the whole Body, and especially in the Precordia; hence the sick complain of intolerable thirst, besides a pain of the Head, pertinacious wakings, and oftentimes a Delirium, Phrensie, and Convulsive motions infest: all Food whatsoever is loathsome, either it is cast up again by Vomit, or if retained, being baked by too much heat, it goes into a Feaverish matter; besides, there happens a bitterness of the mouth, an ingrateful savor, a scurfiness of the Tongue, a vehement and quick Pulse, an Urin highly red, and for the most part troubled, full of Contents, without Hypostasis or laudable sediment; when the Blood is at this time almost wholly inkindled by its deflagration, it begets great plenty of adust matter, (as it were ashes remaining after a Fire) with which the *serum* being very much stuffed, renders the Urin thick, and big with Contents: Also the Blood, being filled with a load of this, to a rising up, is irritated into Critical motions, by which this Feaverish matter, (if it may be done) being brought under, and separated, is shut out of doors; and indeed this state of the Fever induces that, in which a Judgment is discerned, between Nature and the Disease, the strife being as it were brought to an equilibrium; and therefore the evacuation, which follows from thence, is called the Crisis.

The state therefore, or height of a putrid Fever, is that time of the Disease, in which Nature endeavors a Crisis, or an expulsion of the adust matter, remaining after the deflagration of the Blood. To this is required, in the first place, that the Blood hath now for the most part burned forth; because in the midst of its burning, Nature is not at leisure for a Crisis, nor is it ever prosperously endeavored, nor in truth procured by Art with good success. Secondly, That the Spirit of the Blood, doth first, by some means subdue this adust matter, or *Caput mortuum*, separate it from the profitable, and render a period to the expulsion, for otherways, tho' a copious evacuation happens, Nature will never be free from her burthen. Thirdly, That this matter, be gathered together in such a quantity, that by its turgency, it may irritate Nature to a Critical expulsion. If these rightly concur, a perfect Crisis of the Disease, for the most part succeeds, in which, even as in the Fits of intermitting Fevers, a Flux being arisen, whatsoever extraneous and heterogeneous thing, is contained in the bosom of the Blood, is exagitated, then being separated, and involved with *serum*, it is thrust forth of doors; when any thing of these is wanting, the Crisis, for the most part, is in vain, and not to be trusted, and rarely cures

cures the Disease. For if in the midst of the burning, before the Blood hath sufficiently burned forth, an evacuation happens, by Sweat, a Lask, Bleeding, or any other way, the adust matter is not all separated, or else, if for the present, it be drawn away for the greatest part, the Blood more largely flaming out, presently substitutes new, and will renew the Feaver again, that seemed to be vanquished: If that this matter, not being yet overcome, nor brought to a fulness of rising up, be irritated to an expulsion by Nature, an imperfect, and partial Crisis only follows; and when the first endeavor of excretion shall be in vain, rarely a perfect, and curatory succeeds after that one time.

The Crisis in a continual Feaver, is almost the same thing, as the Fit of the intermitting Feavers. For as in this, when the mass of Blood, is filled to a fulness of swelling up, with the Particles of depraved alible Juice, and fitted for maturation, there are made a Flux, secretion, and expulsion out of pores of that matter: so in a continual Feaver, from the deflagration of the Blood, and alible Juice, very many little Bodies of adust matter are gathered together, with which, when the Blood is aggravated, and is at leisure, a little from the burning, it overcomes them, by little and little separates them, and then a Flux being raised up, endeavors to cast them out of pores: wherefore, as the Fits of Intermittent Feavers come not but at a set time, and after so many hours, so also the Critical motions happen from the fourth day to the fourth, or perhaps from the seventh day to the seventh, for in this kind of space, the Blood being inkindled burns forth, and with its burning makes an heap of adust matter, as it were ashes, which being troublesome to Nature by their irritation, induces Critical motions.

Therefore, what some affirm is not true, That the Crises depend altogether on the influences of the Moon, and Stars, and follow their Aspects, Quadrations, Oppositions, or Conjunctions: because the Critical evacuations are only determined, by the gathering together, and the swelling up of the adust matter. For, as soon as the Blood is at leisure, from the deflagration, and being filled with the particle of that adust matter, is able in some measure to overcome, and separate them, presently a Flux, or swelling up being risen, it endeavors to thrust them forth by any way; which, for that they are easily to be separated from the Blood, and the breathing places of the skin are sufficiently open, being involved with *serum*, are sent away with sweat. And this is the best way of the Crisis, which if it rightly succeeds, very often, wholly, and at one time, perfectly cures the Disease, without danger of relapse. To this next, follows the Crisis, which is endeavoured by the Hemorrhage or bleeding at Nose; for this matter, as it were the flowing, being moved with the Blood, (if it be not cast forth by sweat; by reason of a less free transpiration) is transferred from the heart, into some remote part, and frequently is cast into the Head, by the impetuous rapture of the Blood; where, if a passage be open, from the private holes opening into the nostrils, the morbid matter, leaps forth of pores, with a portion of the Blood. But otherways being oftentimes fixed in the Brain, brings a phrensie, delirium, or other grievous and tedious Diseases of the Head; yea, 'tis to be observed, that almost in all continual Feavers whatsoever, when they are hardly or imperfectly cured, so that the Blood is infected, for a long time with the Feaverish matter or adust recrements, that from thence, the nervous Juice (as it seems) contracting an Infection, pertinacious Distempers; to wit, Watchings, also Deliriums, Tremblings, Convulsive motions, and long adhering weakness of the nervous parts follow. Also, there are other ways of Crisis, by which Nature endeavors, not at once and wholly, but by little and little, and by parts, to expel the Feaverish matter; now by Urin, now by Vomit, or Stool, now by breakings forth, and buboes, or biles; by what way soever, that it may be done with a good event, it is required, that the deflagration of the Blood be past, and that the adust matter be concocted, and rendered fit to be separated.

The state or standing of the Disease, is therefore not one, and simple, nor always happens after the same manner, but with a various difference of symptoms, and tending to far different events. But by a prudent Physician, a Prognostication is expedient to be given, in what space of time, the Disease will come to its height or standing, and what end it will have.

If the Feaver be vehement from the beginning, and suddenly invades the whole mass of Blood with a burning; if it urges constantly, and equally without any remission, with a ferocity of symptoms; for the most part, the Blood will so much burn forth, in the space of four days, that the adust matter, will arise to a fulness of swelling up, for the making a Crisis. But if its beginnings are more slow, and the accension of the Blood often interrupted, the Feaver will come to its *achme* or height, about the seventh day. If it should begin yet more remiss, the standing of the Disease is wont to be drawn out, to the Eleventh or Fourteenth day. In the mean time it is to be noted, that as the Fits of Intermittent Feavers return at set times, so the Critical motions in continual Feavers, (but for the most part they observe the fourth day:) for altho' the Crisis may be perfectly prorogued to the fourteenth, seventeenth, or perhaps the twentieth day, because all things, requisite to the full curing of the Disease,

do not sooner concur; yet in the time betwixt, more light motions happen, by which the Feaverish matter arising leisurely, to an increase, is a little emptied, and as it were cut off by parts, until Nature may be able to enter upon its more full discussion; but when the great provision of the adust matter, in the burning Blood, is heaped up in the Vessels, Nature, unless otherways disturbed, on every fourth day, being tyred with the plenty of matter, tries to shake off part of its burthen, by a certain swelling up: wherefore, for the most part, the Critical motions happen on the fourth, seventh, eleventh, and fourteenth days, not by the direction of the Planets, but by reason of the necessity of Nature.

As to the event, whether the Crisis shall be good or not, certain fore-knowledges are taken, from the strength of the sick, the Pulse, Urine, and other signs, and concurrence of symptoms: If the sick appear with some strength, the fire of the Feaver urging, hath a strong and equal Pulse, if the Urine be of a moderate consistency with some sediment, with a separation of the Contents, and easily falling to the bottom, if the Disease shall make its progress, without great Vomiting, Watchings, Phrensie, Convulsive motions, and suspicion of malignity, the standing will be laudable, and to be expected with a good Crisis: if the contrary to these happen, viz. that presently strength is cast down, and that the sick is obnoxious to frequent Swoonings, Convulsions, a delirium, with a weak intermitting or unequal Pulse, if pertinacious watchings, intolerable thirst, and Vomiting continually infest; if the Urine be thick and troubled, without sediment, or sinking down of the parts, if, the burning yet troubling, Nature is provoked to critical evacuations, a very dangerous state of the Disease is imminent, nor may there be hoped for any thing of good from the Crisis.

Concerning the Crisis of a Putrid Feaver, we will here subjoyn a particular Prognostication, in which, though the things, which from the beginning did appear, might promise a most desired event, a very deadly one is imminent; I have often observed, in a Putrid Feaver, which begins slowly, and with a small burning, if the Urine be red, and when rendered presently troubled, and thick, which is not precipitated, neither by the cold, nor of its own accord, puts down a sediment, and if at the same time, the sick lie for many days without sleep, tho' quiet, and that they toss not themselves up and down, their condition is in danger: and the suspicion will be more, if in the mean time, they are neither troubled with a strong Feaver, nor infested with thirst, or with a very troublesom heat; because those distempered after this manner, are incident for the most part, about the state of the Disease, to a Delirium, Convulsive motions, and oftentimes fall into madness, from which they are quickly cast into death; and when these symptoms arise, the Urine is altered, from a thick and red, into a thin and more pale Urine. It seems in this case, the mass of Blood, being taken with the Feaver, not to grow turgid, so with Sulphur exalted to the height, as Wines or Beer are wont in their Effervescencies; but (the Salt, and the terrestrial Lee or Dregs, being stirred together with the Sulphur) to be affected after the same way, as Wines and Beer, being suddenly disturbed with Thunder, and growing sour; wherefore, altho' the Blood does not presently conceive an immoderate heat from the Feaver, yet its disposition being changed, it wholly depraves the Juice destinated to the Brain, and Nervous parts, and therefore about the beginning of the Feaver, pertinacious watchings happen, then the state growing urgent, the œconomy of the whole Nervous stock is perverted. Melancholick persons are most obnoxious to these sort of Feavers, in whom the unruliness of the Sulphur, are a little restrained, by the Salt, and Earthy dregs being stirred up with it, notwithstanding which, all being leisurely carried forth, break forth afterwards, with a greater slaughter.

When the Disease shall come to the standing, either the business is done at one conflict, and from thence with a manifest declination, there is made a translation to life, or death, or there are made frequent skirmishes, between Nature and the Disease, and critical motions are often attempted, before the victory is yielded to either party.

1. As to the first, If after the Blood hath sufficiently burned forth, with a good precursion of signs and symptoms, and its burning hath remitted, the adust matter being equally brought under, and subtilated, arises from a full increase, to the motion of boiling up; and Nature being free from any impediment or depression, is strong with able strength enough, for the decertation or strife, the Feaverish matter, for the most part, is exterminated at one motion of its flowing or putting forth, and the Blood being freed from its fellowship and infection, soon recovers its former vigour.

2. But if Nature is stirred up, to a critical motion, before the Blood hath perfectly burnt forth, or that adust matter is prepared for excretion, altho', as to the rest, things are in a moderate condition; yet from hence, but an imperfect Crisis follows, by which indeed, something of the load or burthen, with which the Blood is oppressed, is drawn away; notwithstanding presently another springs up afresh, in its place, and then at set times, (perhaps, in four, or seven days space) like the fits of intermitting Feavers, the critical motions are repeated, the second, and perhaps the third time, before the strife being ended; the matter openly inclines to this, or that party.

3. But when, with the preceding evil appearance, of signs and symptoms, the burning of the Blood yet urging, the critical motion is provoked, without any coction of the Feaverish matter, sometimes Nature is overthrown at the first conflict, nor doth she recollect her self, but yielding her powers overcome by the Disease, is precipitated into death. Nor is the business much better, when the Crisis is at first imperfect, and in vain, celebrated, without any ease to the sick, and from thence, the next to this succeeds worse, and then in another, and perhaps another conflict, the Disease prevails, until the strength being wholly broken, and cast down, there is a plain end of life.

Thus much concerning the state and Crisis of the Disease, on whose good or prosperous success, the event of the Disease depends; the declination of the Feaver, takes its period of this, of which we must speak next.

4. Altho' the Declining of the Feaver, for the most part, is taken in the better part; that it denotes the condition of the sick growing well of the Disease, in which the Blood, being almost freed from its Effervency, recovers leisurely, strength and spirits, that were lost, and expels what extraneous thing is left remaining in its bosom; yet, in a genuine enough signification, it may be used for that state, when from an ill Crisis, or in vain, the Blood being depauperated, and infected with an extraneous and Feaverish mixture, still declines for the worse, until at length (like Wine changed into a lifelessness) being made wholly unable for circulation, and accension in the Heart, it calls on death. Therefore, in this place, the name of declination signifies the condition of sick, and of the Disease, which follows the standing, whether it tends to life, or to death; whether the Feaver, or life it self of the sick, at this time, declines.

As to the times of declination, it will be worth our labour to inquire, what the temper of the Blood may be, and what turns of alterations it has undergone, as often as from a good, or bad Crisis, there has been made a progress of the Disease, towards Health, or Death. To wit, first, what the disposition, or condition of the Blood and Spirits may be, from a good Crisis, and with what alterations, its spoiled Liquor recovers its former vigor. Secondly, what their temper is, from an evil Crisis, and by what degrees it still tends to worse; and lastly, how they are, when from a doubtful state, and long weakness, the sick hardly get up at length, and recover their health.

The vice, or depauperation, which the Blood hath contracted from the Feaverish heat, consists in this: The Spirit very much evaporates, and is lost: the Sulphureous part is too much scorched, and is much wasted by the deflagration, and from its burning, the adust matter (as it were the *Caput Mortuum*) is left, with the Particles of which, the mass of Blood is aggravated, and debilitated; in the mean time, the Saline and Earthy parts, are too much exalted, even as is wont to come to pass in Wine, or Beer, by the use of too much Ferment. The Blood, by these ways being spoiled, evilly assimilates the provision of the Nutritious Juice, yea also, by reason of the roasting of the Sulphur in the Heart, or defect of it, not rightly Fermenting, or inflamed, it untowardly dispenses the Vital Spirit, in the mean time, from the adust matter, and Salt too much exalted, it grows more fervent than it should, and more wastes it self.

1. From a good Crisis, the Spirit, tho' made weaker, yet gets the upper hand, wherefore, what is left of the Feaverish matter, it by degrees overcomes, and expels; and concocts, and assimilates (so what is brought be thin or slender) the Nutritious Juice: from thence, the mass of Blood is amended anew, with Spirit and Sulphur; and the Blood which now being Salt and sharp, did continually grow hot, acquires at length a Sweet and Balsamic Nature, and being quickned with a lively motion and heat, rightly performs the offices of life and sense.

2. From a bad Crisis, the business is otherways, the Liquor of the Blood (like Wine too much Fermented) degenerates, almost into a vappidness, or lifelessness; its Spirit is greatly diminished; the Reliques which remain, are intricated, and, as it were, overwhelmed, with the Particles of Adust Matter, from whence there is yet a continual growing hot remaining in the Blood, yet without concoction, or assimilation, of the Alible Juice, or separation of the profitable, from the unprofitable. The benign Sulphur, and the Food of the Vital flame, is much consumed, so that the Blood is less inkindled in the Heart, than it ought to be; in the mean time, from the Adust Recrements, and also the Salt, and Earth being too much carried forth, it perpetually burns in the Vessels, with thirst and heat. And because it is dayly depauperated, the Spirit and benign Sulphur being wasted, and more infected, with the Salt, and Earthy dregs being too much exalted, its Liquor in a short time becomes tasteless, and is made unfit for circulation, and for the inkindling in the Heart, for the sustaining the Vital fire: wherefore there is a necessity that life be lost, even as the flame of a Lamp is extinguished, when instead of the wasted Oil, a Salt and Muddy Liquor only supplies it.

3. From an imperfect and doubtful Crisis, when the sick being weakned by a long imbecility, become not well, but of a long time, the business is after this manner; The Spirituous and Sulphureous parts of the blood are very much consumed by the slow deflagration; the remaining Liquor, being not purged from the adust recrements and feculencies, is rendred very impure; but when there is yet remaining somthing of Oil for the Vital Lamp, nor Spirits are altogether wanting, for the subduing the Feaverish matter, the blood is still circulated, and (though but smally) is enkindled in the Heart; yea, and by little and little the Spirits recollect themselves, set upon the matter remaining of the Feaver, and what they are able, begin to overcome it: then by a pertinacious assiduity of coction, like a flame, wavering and half extinct, among green wood, at length rise up victorious, and restore anew, both with heat and motion, leisurely renewed, a quick and lively Fermentation, in the Heart.

So much in general of the Feaver called Putrid: it remains, before we descend to the kinds, and particular Cases of it, that I recount the symptoms and signs chiefly notable, in the course of this Feaver, and subjoin the Reasons and Causes of them, and their manner of being done.

CHAP. X.

Of the Symptoms and Signs chiefly to be noted in a Putrid Feaver.

THE Symptoms, coming upon a Putrid Feaver, although they argue the oeconomy of the whole Body, to be for the most part depraved, and the disposition and Functions of some part, or Member hurt; yet, the Accidents, which a Physician ought chiefly to consider, about the Diagnosis of this Disease, and its Prognosis to be rightly instituted, may be referred to three classes or common places; to wit, they have respect to the Viscera of Concoction, viz. the Ventricle, and Intestines, with their Appendixes: Or secondly, to the Humors, flowing in the Vessels, viz. the blood in the Arteries and Veins, and the thin Liquor in the Nervous parts, together with the chief Springs of either, viz. the Heart, and Brain; or lastly, these Symptoms respect the habit of the Body, with the various constitution of the pores, and the extension or emaceration of the solid parts. They, who would exactly observe the course of this Disease, and would fitly draw out Curatory intentions, may take notice of these three heads of Symptoms, and carefully consider what alterations may happen in these; as it were distinct Regions, according to the different times of the Feaver.

1. Troubles and Disorders, such as Nauseousness, Vomiting, want of Appetite, Indigestion, a Looseness, a Scurfiness of the Mouth and Tongue, a bitter Savour, are wont to infest about the Ventricle, and first Passages, in the whole course of this Feaver. These, for the most part, are attributed to the humors, first heaped together in the Stomach, and there putrefying: But besides, that the recrements of the Chyle, being thoroughly roasted, by too much heat, degenerate into an hurtful matter, very often these kind of Accidents happen, for that the Purgings, and the Filth of the Blood and Nervous Juice, while they grow hot, are carried inward, and being deposited in the membranes of the Viscera, provoke Convulsions, and also make a filthy heap of vicious and very infestous humor. I have often observed, that about the beginning of the Feaver, the blood growing hot, laid aside its recrements even inwardly, with a benefit to the sick, where, although great molestations did arise about the first passages, yet the burning was therefore more mild, the Pulse moderate, and the Urine laudable, and these being after this manner in a Feaver, quickly grew well, with a slender Diet, and the use of gentle evacuations. But if in this case I should administer a vehement Cathartic, for the extirpating the humors, that natural purging of the Blood being hindred, presently the Feaver became strong, with a red Urine, and troubled, a deep Pulse, Watchings, and other horrid Symptoms; also, oftentimes after the state of the Disease, by this interior kind of Lustration or Purgings, the adust matter, and excrementitious, is separated from the Blood. Hence sometimes a Lask, sometimes a scurfie covering of the Mouth and Throat, follow: Wherefore, there is need of caution, about the Accidents which happen in the first passages, lest that whilst we oppose them, we should pervert the motion of Nature; and lest whilst we fortifie these parts against the course of the Morbific matter, we untowardly keep the same shut up in the Mass of Blood.

The Symptom chiefly to be considered, about the bloody Mass, are, an heat diffused through the whole, a burning of the Præcordia, Thirst, a Disorder of the Pulse, a red Urine, a spontaneous wearisomness, a loss of all strength, out of which rightly considered, these things following may be known, viz. what the manner of the heat is, or with what tenor the burning blood

flames forth ; what time of remission, or of encrease its Effervescency observes in the deflagration ; whether it retains its Crasis or Mixture whole ; for the burning of it, and circulation of it enkindled, what strength of the Heart will suffice, and what space the Vessels may require ; so long as the blood burns, what plenty of adust recrements it may heap up, by what means it may overcome, separate, or at least endeavour to separate the same, and lastly, what way of a Crisis it endeavors, and with what success.

The Accidents which have a respect to the thin Liquor, with the Brain, and nervous Appendix, are disorders concerning Sleep and waking, a debility of the whole Body, a Trembling, Shivering, Pains, Convulsive Motions, Cramps of the Viscera, Stupescence, Phrensie ; and the observation of which suggests what the temper and constitution of that thin Liquor may be ; by what means it waters, and insulates the nervous parts, and performs its Circuits through them ; how the Animal Spirits execute the functions of the Viscera ; what the state of the Brain may be, whether it remain free from the incursion of the Feaverish matter, or whether it be not in danger of being overwhelmed, by reason of its Critical Metastasis or Translation.

Concerning the habit of the Body, may be observed, what may be the reason of sweating, and the manner of it ; whether only by vaporous *Effluvia*, or by Sweat, or also by little weakks ; whether the Flesh falls away on the sudden from its wonted bulk ; or whether it retains it self a long while ; what the colour of the Face is, and the vigor or habit of the Eyes ? From these well laid together, the course of the Feaver may be best of all measured ; at what time it will come to its height or standing ; whether Nature will prevail over the Disease or not ; with what manner of separation, and with what success she will endeavor the expulsion of the Feaverish matter ; also by these signs may be learned, by what degrees the blood growing hot, and often congealed, doth tend towards Putrefaction or Corruption ; whether it does any thing concoct the alible Juice poured to it ; or whether or not it presently casts forth of doors all its provision by Sweat, as often happens in the declination of this Disease.

By these Symptoms and Signs, a yet more plentiful Indication may be had, if first it be known upon what Causes the several Species of them depend, and, by what provision they are wont to be raised up in our Body : wherefore I have thought it worth our labour to recount particularly the chief of these ; and to explicate the Reasons of them, and their ways of working.

But the Symptoms chiefly to be observed in a putrid Synochus, or continual fervor without intermissions, are, an heat in the whole Body, a spontaneous Weariness, a burning of the Præcordia, intolerable Thirst, an Ardor and Scorchiness of the Tongue, or Jaws, a Pain of the Head and Loins, pertinacious Watchings, Phrensie, convulsive Motions, a Syncope, Heart-burning, Vomiting, Nauseousness, a want of Appetite, a Looseness, a Flux, with which, not all at once, now with these, now with those, this Disease is wont to be beset.

1. Heat, which is felt sharp and biting, in the whole Body, depends upon the too great effervescency of the Blood, and the accension of it in the Heart ; for the Sulphureous or Oily part of the blood being exalted, and taking an heat, is enkindled in the Heart, in a double proportion, more than it was wont ; wherefore, it copiously diffuses, by its deflagration, *Effluvia* of heat through the whole Body. When the Sulphur is less dissolved, and enkindled in the Heart, as in the Green Sickness, or the white Dropsical Disease, &c. Heat is wanting in the whole ; but in a Feaver, when the Sulphur too much burns forth, Heat superabounds. For heat depends not only upon the actual inflammation of the Sulphur, or the firing of it, but an intense heat is excited without fire, in many mixtures, where the Particles of Sulphur are dissolved by corrosion, or are more thickly heaped together for want of ventilation ; wherefore, when Iron is corroded by an acid mineral Spirit, or when Spirit of Nitre is poured on the Butter of Antimony, a mighty heat with a Fume is produced ; in like manner when Dung, or Hay laid up above measure in Feavers, to wit, the particles of the Sulphur, being too much exalted, and made hot, are more thickly heaped together in the Vessels, and are more dissolved, and as it were enkindled by the ferment of the Heart ; wherefore, they every way diffuse heat, being loosened in the bond of the mixture, and every where stretched forth or expanded.

2. A spontaneous Weariness or Lassitude is felt in the whole Body ; to wit, by reason of the Vessels being distended with the boiling blood, also the musculous flesh is very much stuffed with blood, and a copious breath, that it is made less fit for motion, as they who are sick of an Anasarca, have their Limbs very unwieldy by reason of the abundance of serous humor ; besides, in Feavers, by reason of the inflammation of the blood, the Juice, which is sent for a supply to the nervous stock, departs from its due temper, that it becomes little fit for the actuating the Body.

3. The burning of the Præcordia is made, by reason of the blood being more copiously enkindled in the Chimney of the Heart, which from thence boils forth into the Lungs, with great ardency ; wherefore by how much the nearer this Region is to that fire-place of Heat, it is pierced therefore with the greater burning.

4. An almost unquenchable Thirst is caus'd, both from the glowing heat in the Præcordia, also by reason of the sharp and hot particles of the Feaverish Matter, affixed to the Ventricle, in the circulating of the Blood; which indeed desire to be washed, even as salted and spiced Meats, being plentifully eaten, or also strong, or sower things, rolled in the Mouth or Throat; for this kind of Distemper calls for a more free swallowing down of Drink, as a Member too much heated, the pouring on of cold water.

5. The Ardor and Scurfiness of the Tongue and Jaws, as also oftentimes an accretion of a certain white, or yellow, or black filth, happen without doubt, because of the Heat and Soot exhaled from the Ventricle and Lungs, burning with heat: but the Tongue grows white, as often as that humidity (with which it is naturally much imbued) is dried up, and parched, and so the exterior skin of the Tongue, is as it were roasted, by the burning heat, from hence also it becomes scurfie; which is also seen in healthful people, when it happens that the Tongue is scorched by Broth, or any other very hot Suppings; in like manner, as when the Tongues of Animals are boiled, for the use of the Table, their Skin becomes white and sharp, or rugged. For whether the Spittle is drawn from the maxillary Glandula's (as the Doctrine of the most ingenious *Wharton* hath first made known) or any other humor from the Glandula's of the Jaws, or elsewhere; yet because, by reason of the heat and driness, it grows too thick, and becomes clammy, also then the outward skin of the Tongue grows nevertheless white; but also it is covered with a certain filthy Glew, to wit, because that humor, by reason of its thickness, may smear the Tongue, but cannot wet or moisten it; but if it happens, that the Tongue is inwardly suffused with a bilous humor, or outwardly tinged (as comes to pass by the use of Choler-abounding Vomits) then its hairy Nap being spongy, imbibing the yellow poyson, exhibits also the like Colour. If that lastly, the heat be so strong, that it burns the Blood, and enkindles a fire, more ardent than usual, it follows, that from the fire-place of the Heart, the breathing places through the Lungs, scarcely sufficing for the ventilating so great fire, soot or smoak is raised up, which being smitten to the furnace of the Palat, strikes against the Tongue, as it were in a Reverberatory, and infects it with Blackness. But this same kind of Blackness (and as other filthinesses of the Tongue) is most conspicuous in its middle parts, because the more exterior compass is cleansed by its frequent rubbing against the Gums and Palat.

6. Sometimes it happens in Feavers, and especially about their declinations, that the Tongue, Palat, Gums, yea the Cavity of the whole Mouth and Throat, are covered over with a certain viscous matter, as it were a whitish Crust; which being often wiped off, presently new Springs again; and unless by rubbing diligently, and washing the Mouth, this crusty matter be frequently wiped away, the sick are in hazard of being choaked. This kind of Distemper is most often excited in Children newly born; for they are wont, for the most part, within fourteen days with an external growing hot, to be sprinkled through the whole skin, with broad and red spots; if that this suffusion of redness do not freely break forth, or vanishes away sooner than it ought, for the most part, this whitish Crust follows, in the parts of the mouth. This Symptom, when it troubles Infants after this manner, is wont to be ascribed to the fault of the Milk, to wit, that being too sharp, it induces the ulcerous Distemper of the Mouth. In those sick with Feavers, it is commonly attributed to thick Vapors and footy, elevated from the Ventricle; But to me it seems most likely, that in either, this Distemper arises from the impurities of the whole Blood (and perhaps in some measure of the Nervous Juice) deposited about these parts: for, as often as in the mass of either humor, any extraneous thing intimately mixed, is contained, that it is not to be dispersed by Sweat, nor easily sent away by Urine, that most often is fixed with the serous filth about the Mouth; from whence Catarrhs, Tumors, and troublesome Spittings are caused: For when for the chewing of the meats, the Salival humor in this place ought to be plentifully suffused, Nature very often endeavours to send forth of doors what is superfluous, or otherwise troublesome, by these usual ways of Excretion. Hence from Mercury being taken, when both the Blood, and nervous Juice are abundantly stuffed, with its most finely divided Particles, and endeavour to thrust them forth, being involved with Serum, because they are not able to exterminate those Mercurial little Bodies, being intimately confused, neither by Sweat, Urine, or by any other ways, what is remaining, they endeavour to expel through the Arteries and other Passages, which supply the Mouth with Spittle, the same being involved with the serous Latex.

Also in like manner, in Feavers, when from a long deflagration of the Blood, the adust matter is very much heaped together, of which no small part remaining, after the Crisis, is yet confounded with the Blood, and Nervous Juice, being fixed either to the Brain, or to some other place, from them it is at length supped up again, 'tis most probable, that this matter is thoroughly roasted, by a long Concoction, and so becomes almost like Glew, thick; wherefore being not able to be dispersed, neither by Spittle, or insensible Transpiration, nor to be separated by the Urinary Passages, but at length leisurely runs out by the little Arteries, and other Passages of the Spittle, lying open into the Palat, as the most usual way of excretion, and forthwith by reason of its thickness, grows into that Glewiness. The same reason holds

In Infants, whose blood being made impure, by filths contracted in the Womb, presently it endeavors to purifie it self, by that exterior putting forth, which if it do not rightly succeed, by reason of the thickness of the matter, immediately the viscous impurities are exterminated by this way, as the more open. I have known some, in the declination of a Feaver, to whom, not only this kind of Crust of gummy matter has happened in the parts of the mouth, but a copious salivation, as if they had taken Mercury, with a stinking of the breath, also a swelling of the Tongue and Gums, hath been raised up for many days.

7. The pain of the Head, in Feavers is excited, because the Meninges of the Brain, being pulled or hauled with Vapors, and with a sharp Blood, and hot, for the Blood being impetuously moved, by reason of the direction of the great Artery, is carried in a greater plenty to the Head, than to the lower parts; because the passage from the bosom of the Heart to the Head, is straight, from the same, to the inferior members, oblique, and as it were reflected; wherefore, as the membranes are very sensible, and that there the Blood is stopped, and reverberated, in its rapid course, it is no wonder, if cruel Head-aches are excited in Feavers. Besides, this impetuous flowing of the Blood, wherewith (as it were by a certain Ramming) the membranes of the Head being distended, ache grievously; also sometime, Head-aches arise, by reason of the Nervous Juice (which is supplied from the burning Blood) being too sharp and pricking; wherefore, when the membranes, and nervous parts are watered with the same they being pulled by its acrimony, are moved into Pains and Convulsions.

8. Inlikemanner also, the other Distempers of the Head, as Watchings, Delirium, Phrensie, Convulsion, &c. arise, sometimes from the Blood being in a rage, and so stirring up inordinate motions in the Brain, and sometimes also from the nervous Juice being depraved, and therefore made impropportionate, to the regiment of the Animal Spirits: But most often, these kind of Symptoms are frequent in Feavers, by reason of the translation of the Feaverish matter from the bosom of the Blood, into these parts. For the Blood, being full of the adust Recrements, remaining after the deflagration, endeavours (like the flowing of new Wine) to subdue, and exclude them from its company, by every manner of way; which, a Flux being arisen, when it cannot expel by Sweat, Urine, or Bleeding, it oftentimes transfers to the substance of the Brain, and there fixes them; and from hence chiefly, the aforesaid Distempers, when they are fixed, and firmly rooted, draw their Original, whenas the lighter, and that are easily moved, often proceed from the afore-recited Causes.

9. Convulsive Motions happen in Feavers, for divers causes; sometimes, because of the matter being heaped together in the first passages, which there hales the membranous parts, with its notable pravity, and then, by the consent of the nervous stock, the Convulsion is presently communicated to the beginning of the Nerves, in the Brain, and by that means draws aside now these, and now those parts: by which means, Worms abounding in the Viscera, sharp Humors being stirred, and strong Medecines, induce Convulsions: Or secondly, when the Feaver is a partaker of some malignity, so in the Small Pox, Measles, or the Plague, frequently Convulsions happen; to wit, because the Blood is altered from its benign and natural temper, into a destroying and venomous, by which the Nerves, and their beginnings are peirced, and forced into Convulsions. Also, oftentimes without the suspicion of malignity, in a putrid Feaver, Convulsive motions are induced by reason of the translation of the Feaverish matter to the Brain, as was but now intimated: so I have often observed, when the Disease is not presently cured with the Crisis, the sick lie by it with a tedious sickness, and are made obnoxious to Tremblings and Convulsive motions. Thirdly, and lastly, for the most part in every Feaver, which terminates in Death, Convulsive motions are the sad fore-runners of it; which I think to happen, not only from the malignity of the Matter, with which the nervous stock is pulled and pierced, but because the Spirits, very much exhausted and debilitated, do not sufficiently blow up, and distend the Bodies of the Nerves; wherefore, being released from their wonted extension, and tonick motion, they are however by a more weak endeavor of the Spirits agitated into a disordered motion.

10. A Syncope or Swooning, is wont to be raised up several ways in Feavers; but chiefly for these three causes, to wit, either from the mouth of the Ventricle being distempered, which part as it is interwoven with a manifold texture of Nerves, is very sensible; and because from the same branch of the sixth part, little shoots of Nerves are equally derived to the Heart, and to the Ventricle, if the Orifice of the Ventricle, so implanted with Nerves, be distempered with any great trouble, it is also communicated to the Heart, and either the motion is stopped in it, or at least an inordinate one is excited, whereby the equal Flux of the Spirits and the Blood is interrupted for a time. I knew one in an acute Feaver, taken with a frequent swooning, which distemper wholly ceased, after he had cast forth by Vomit a long smooth Worm. Secondly, a Syncope also is sometimes induced, because the invenomed matter is circulated with the Blood, which suddenly fixes and extinguishes the vital Spirits, and congeals the Blood it self, that it is apt to stagnate in the Heart, as usually happens in the Pest, Small Pox, &c. of which we shall speak particularly hereafter. Thirdly, A Syncope is wont to happen,

happen, by reason of the more rare texture of the Spirits, which as they are very tender and subtil, are easily unbent, by any immoderate motion or pain: so I have known some, who being quiet in bed, have found themselves well enough, but being removed from one place to another, presently have swooned away.

11. The pain of the Heart happens in Feavers, when the Ventricle, and especially its Orifices, by reason of the manifold insertions of Nerves, being very sensible, are beset with a sharp and bitterish humor, or else with an acid, and corrosive; for hence a pain and trouble arises from the acrimony of the humor, after the same manner, as when the sphincter of the fundement is afflicted, in Choleric dejections, with pain and molestation.

12. By reason of the same Cause, Vomiting, and Nauseousness, are wont to be excited; to wit, by the Ventricles being beset, and irritated to a Convulsion, from an extraneous matter, and not akin to it self: Such an excrementitious matter, may be gathered together in the Ventricle, by three ways; for either the Aliments, partly by reason of a want of an Acid Ferment, by which they should be rightly Cooked, and partly by reason of the burning heat of the Ventricle, are roasted into such a Corruption; or, Secondly, this kind of matter, is laid up in the Ventricle, from the Arteries, terminating in its Cavity, as uses to happen in the Small Pox, the Plague, and malignant Feavers; or, Thirdly, meer Choler, being pressed forth from the Choleduct Vessels, into the empty Intestine, by reason of an inverse motion, and as it were Convulsive, of that Intestine, it is poured into the Ventricle, want of Appetite, also happens, by reason of the Ventricles abounding with vitious Juices, and because the Acid Ferment, is wholly perverted, by the scorching heat. These kind of Distempers of the Ventricle, and Viscera, sometimes arise from an excrementitious matter, (to wit, alimentous, degenerated in the concoction) heaped together, a long while before the Fever, in the first passages, which not seldom becomes, the occasional cause, of the Fever it self: but sometimes, nauseaousness, want of Appetite, Vomiting, pain of the Heart, &c. are the immediate products of the Fever; for when the day before the sickness, those distempered, have been well enough in the Stomack, as soon as the immoderate heat of the Blood was induced, whilst it boiled up above measure, both the *Effluvia*, and the Recrements, being wonted to be evaporated outwardly, also the bilious humor, flowing out of the Choleduct Vessels, are poured into the Ventricle; by which, its Crisis is overthrown; also the Reliques of the Chyle, and other Contents in the Viscera, are egregiously depraved; from whence, the aforesaid Distempers draw their Original.

14. No less frequent a Symptom in Feavers, is a Diarrhea, or Flux of the Belly, which sometimes happens about the beginning of the Disease, and arises (for the most part) either from the Bile, flowing forth of the Choleduct Vessels, into the *Duodenum*; or from the Recrements of the Blood, and Nervous Juice, poured forth from the Arteries, and the passage of the Pancreas, into the Intestines. All the aforesaid humors, (but especially the Choleric) when they are supplied in abundance, often Ferment with the mass remaining of the Chyme, that the same swelling up with a spumous rarefaction, irritates the Intestines, and provokes to the motion of excretion: sometimes also, about the standing of the Disease, and in the declination of it, a Lask is excited; and so, either Nature being Conqueress, the more thick purgings of the Blood, are this way critically sifted forth; or being overcome, the Flux of the Belly, is the effect, and sign, of the Viscera wholly losing their strength, and firm tenour. It sometimes happens in a Fever, that the Belly is always bound, that it is not at all loosened, but by Physick, and tho' the sick take nothing but liquid things, for many days, the stools are still of a solid consistence, and hard, this seems for the most part to be done, when the Blood growing sharply and exceeding hot, like fire, consumes the humidities; wherever they flow, and draws to it self, out of the Bowels, the watery matter, by a Copious emission of vapours, and presently makes it to be evaporated outwardly: wherefore, the thicker part, being left in the Intestines, is made firm, from the scorching heat, as it were a *Caput Mortuum*, remaining after distillation.

A Dysentery is a Distemper, so frequent in continual Feavers, that some years it becomes Epidemical, and not more mild than the Plague, kills many: The cause of it is wont to be, not any humor produced within the Viscera, that corrodes the Intestines with its Acrimony, (as some affirm) but a certain Infection impressed on the Blood, and so intimately confused with it, that, under the form of a vapour, or a sincere humor, it cannot be pulled away from the Blood: wherefore, the thrusting forwards, towards the Intestines, unlocks the little mouths of the Arteries, and makes there little Ulcers, and exudations or flowings forth of the Blood, like as when from the Feverish Blood, Pustles and Inflammations break forth outwardly, with a flowing towards the skin: But it is most likely, these dysenteric distempers, which accompany Malignant or Epidemical Feavers, arise from a certain coagulation of the Blood, as shall be more fully declared hereafter.

And here also, among the symptoms of Feavers, might be recited, what are wont to appear outwardly, in the superficies of the Body, as are Spots, Wheals, Buboës, Carbuncles, &c. but because these belong after an especial manner to a Malignant Feaver, therefore we will forbear in this place, from the consideration of them, until we shall speak of the Plague, Small Pox, the Pestilential, and Malignant Feaver.

The Pulse and Urine shall conclude here the troop of symptoms and signs in a Putrid Feaver, which are much heeded, for the finding out, both the state and the strength of the sick : For, as there are two things, by which our life is propped, *viz.* Heat inkindled in the Heart, and concoction to be made in the Viscera, and Vessels, because the Pulse and Urine, best show the alterations in either, induced in a Feaver, therefore from hence, a most certain judgment is taken of this Disease, about to end, in Death or Health. I think it is not needful, to speak of these at large, or to recount the several causes and differences of either : It will suffice for me to note here, the chiefest things of them, and what are worthy of consideration in the course of Feavers. And first of all the Pulse is consulted, as it were a Thermometer or Weather-Glass, constituted by Nature, that from thence, the heat inkindled, in a Feaver might be meted ; which if it should be more strong, stirs up a great ebullition or boiling up of the Blood, the Artery beats more strongly and quicker, so long as the Spirits are in strength ; then they being a little exhausted, the more strong Pulse is remitted ; which however is compensated with swiftness, and is made quick, and small. If the Feaver be gentler, and is troubled with a lesser burning, the Pulse also declines less, from its Natural condition, and the moderation of this, in the whole course of the Disease, denotes the traces of Nature. Neither doth the Pulse only, betray the forces of the Feaver, as of an Enemy, but shews also plainly the strength of Nature, and her ability of resisting. So long as the Pulse is laudable, the matter goes well, and it shews good hopes ; but from the evil state of this, a bad omen is shewn, and a despair of Health. So without a frequent, and diligent examination of the Pulse, a Physician cannot make a right Judgment or Prognostication, or safely prescribe Physick.

1. As to the first thing, it ought to be known (as much as may be) what every ones Pulse is, according to its Natural Constitution ; for it is in these stronger, in those weaker : then it is to be considered, in every moment of the Feavers, by what degrees it is distant from its Natural state : for now it is sometimes more vehement, and argues the Feaver to grow stronger ; now it is depressed, below its wont, and denotes the Spirits and Strength dejected.

Those whose Pulse in Health beats weakly and languishing, when taken with a Feaver, if they have a small and weak Pulse, it is not so evil a sign, that we should presently despair of their Health : In whom the Pulse is by Nature strong and vehement, if after the Crisis of the Disease, it hath scarce a moderate vigour, tho' it be not wholly weak, it argues the condition of the sick to be suspected, and not safe.

If from the beginning of the Feaver, before the Blood has flamed out, or if a Crisis being made, when part of the burthen is drawn away, or at another time, without an evident cause, the Pulse becomes weak, it portends evilly : but if after long watchings, or great evacuations, the Pulse is made a little weaker, Health is not therefore to be despaired of, because the strength cast down by these means, or overwhelmed, may be restored, and the Spirits renewed.

When the Pulse is suddenly altered for the worse, tho' the sick seem to be better, as to the rest of the symptoms, you may forespeak the sad prognostication of Death ; and so contrariwise, altho' most horrid symptoms urge, and yet the Pulse is laudable, Health may be yet hoped for. If in a strong man, that hath a Feaver, the Pulse is very small, and creepingly, or becomes like the motion of Ants, death is at hand.

2. In the exhibiting of Medicines, cautions and rules of no small moment are taken ; Purging and Vomiting are forbid, by the pulse being too quick and violent ; also by being low and depressed ; because, whilst the Blood is too fervent, evacuation helps little, because both what is hurtful is not separated, also for that by the perturbation, the strength or spirits, are more debilitated. But when the spirits are broken, and strength cast down, Medicines cast them more down, and sometimes wholly overthrows them. Wherefore, when a Physician thinks of evacuation, upwards or downwards, he first examines the pulse, and goes about this work only, when Nature is strong and quiet ; that she may at once be at leisure, for the operation of the Medicine, and may have sufficient strength.

Nor is there less need of circumspection, in sweating Medicines and Cordials : which, if administered in the Feaverish fit, do too much strengthen, the former violent motion of the Heart, and oftentimes break its strength ; also, when the Pulse is very languid, if hot and strong Cordials are administered, (as when a small flame is troubled with a more strong blast of wind) life is easily extinguished ; wherefore, 'tis a vulgar observation, that Cordials often accelerate death, for that by too much troubling the Blood, they sooner beat down strength.

There is yet the most need of the caution, and direction of the Pulse, in exhibiting Narcotics ; for these, (because they perform their work by extinguishing, and fixing, the too fierce vital spirits) if used in a weak or inconstant Pulse, either by diminishing the vital spirits, render them

them wholly insufficient for the Disease, or by suffocating them too much, cause a perpetual sleep: wherefore, in a languid, unequal, or formicating, or creeping Pulse, Opiats are to be shunned, more than a mad Dog or Snake.

An unequal and intermitting Pulse has a most evil Report from the Writings of Physicians; yet, although of an ill note, does not so certainly portend Death, as a Weak Pulse; for I have known many to have recovered, though, by those kind of signs condemned to the grave; because the inordination of the Spirits and the Blood, may be more certainly and easily composed, or allayed, than their dejection restored.

2. The Inspection of Urines in Fevers, before all other Diseases whatsoever, hath more of certainty, and is of greatest use, for from hence, the conditions of the sick, and of the Disease are best known, and the Medical intentions, concerning what is to be done, are better directed; what Observations and Rules concerning this thing, are vulgarly set forth, are so many, that it would be almost an infinite labour and tediousness, to recount them all: it will be sufficient here to note the chief of them.

Concerning the Urines of persons in Fevers, there are chiefly to be considered, the Colour, Consistency, Contents, and Subsidency or Setling. The Colour of the Urine shews the measure or excess of heat in the Blood; which, as it is increased, and becomes more remiss, the Urine also is more or less red; the cause of which is, the ebullition of the Blood, or the Effervescency induced from the Fever, to the Blood; by reason of which, the particles of Salt and Sulphur, implanted in the Blood, Humors, and solid Parts, are more dissolved, and incocted with the Serum, and impart to it a redness; even as, when Salt of Tartar, and common Sulphur being mixed one with another, and boiled in water, impart a deep red colour to the Liquor.

The Urines of some are highly red, when they are but a little or lightly Feaverish: and on the contrary, the Urines of others, labouring with a Feaverish Burning, are less coloured. Who abound with lively heat, and a very hot Blood, or are obnoxious to the Scurvy, Phthisis, or Hypochondriack Distemper, when by taking Cold, Condensation, Surfeit, or Drinking of Wine, they are troubled by any little Fever, they render a Urine strongly red; for that the Particles of Salt and Sulphur remain exalted in their Blood, and before half loosened; wherefore there is a necessity, that the Fever urging, they are more boiled in the Serum; on the contrary, they who are endued with a cold temper, with a faint and weak Pulse, being taken with a Fever, with a greater effervescency of the Blood, render their Urine less coloured.

The Consistency; Contents, and Subsidency of Urines, being put, as it were, upon the same Thred, depend all of them, on the adust and recrementitious matter, which is remaining in the Blood, after the Feaverish deflagration: if there shall be plenty of this, the consistency of the Urine becomes somewhat thicker, and after it has stood, it is troubled by the Cold; but if there be a lesser quantity of this, or otherwise derived than to the Reins (to wit, by Sweat, or is called away by a critical Translation, to this or that part) the Consistency is made thinner, and the Liquor remains clear. Also the Particles of this Matter do enlarge the Contents of the Urine, which shew themselves diversly, according as the nutritious Juice, is now somewhat cooked, and assimilated by the Blood, now altogether perverted, and carried into a putrefaction, some signs of Concoction and Assimilation shew themselves in the Urines of Feaverish persons, now a laudable Hypostasis, now some Marks and Rudiments of the same. A want of Hypostasis, and the Confusion, and Perturbation of the Urine, denote the Concoction vitiated. But as this Matter is more or less roasted in the Blood, the Contents are now of a pale, now of a red Colour, like Oker. By reason that the recrement, confounded with the Blood, either the Spirit being strong, begin to be overcome, and separated, or the same being depressed too much, they are less able to be separated: also the Contents of the Urine are wont to be more or less, sooner or slower separated from the rest of the Liquor, and to sink down towards the bottom.

As to the Prognosticks, to be taken from the Urine, we may take notice, that the Colour of the Urine being somewhat more remiss, the Consistency mean, the Contents few, the Subsiding free, or easily collected into a Cloud, portend good: on the contrary, a deep red, a thick and troubled Consistency, thick and cloudy Contents, which slowly or scarce at all sink to the bottom, denote a very great Heat, plenty of adust Matter, and its being brought under, and secretion, difficult, or frustrated.

As to the Medicinal Directions, the business depends on this, that we attend, by the frequent inspection of the Urine, the motion of Nature, and be helpful to the same; neither is it to be moved by Purge or Sweat, but when a certain Hypostasis of the Urine shews signs of Concoction and Separation. I thought it needless to say any more here concerning this Matter, because those things are more largely handled elsewhere, in a proper place, which belongs to Urines.

CHAP. XI.

Of the Kinds, and Cure of a Putrid Synochus, or Continual Fever.

AN D thus much for a Putrid Synochus in general, in which is described its formal reason, according to the Accidents and Symptoms which are commonly observed in its Figure; there are besides (I shall not say Species, but) but some Varieties or Irregularities of this Disease, in which this Fever sometimes declines from this common Rule, and by reason of some accidental Distempers, gets new Names and Distinctions:

In the first place therefore, a Putrid Synochus is wont to be divided into Symptomatick, and Essential; It is called Symptomatick, which draws its beginning from some other Distemper, or Disease before excited in the Body, so that the Fever is only a Symptom, coming upon that other Disease: of which sort is accounted, what depends upon the Squinancy, Plurisie, the Inflammation, or Imposthume of the Lungs, or any Imposthume from a wound, or Ulcer in a principal part, or its Neighborhood, of which we think a little otherwise, *viz.* That truly no putrid Fever is merely Symptomatick; perhaps it may arise occasionally, from some other Distemper; but it is founded immediatly, in the Sulphureous part of the Blood being made too hot, and as it were enkindled: for without a Procatarsis, or preceding indisposition of the Blood, the aforesaid Distempers, rarely, or not at all, cause a Putrid Fever.

As to what respects the Squinancy, Plurisie, the Inflammation, or Imposthume of the Lungs, and the like; I say, that these are the products of the Fever, or Distempers following it; but by no means the cause of it: for most often the evident Cause, went before, which produced the feverish Effervescency of the Blood, as a taking of cold, evacuation being hindred, &c. then, although the sick do not openly grow presently into a Fever, yet a greater ebullition of the Blood, than was wont, is stirred up, as may be easily conjectured from the Urine, Pulse, and inquietude of the whole Body. After some days (now sooner, now later) an Inflammation is brought forth in one part or other; the reason of which, may probable enough be said to be of this sort: The Blood, by reason of the *Effluvia* being retained (which are like ferment) is increased in its bulk, and grows more turgid than its wont, in the Vessels; and when for want of Ventilation, it is streightned in the space of its Circulation, it easily springs forth, where it can find a passage, through the Arteries, and being extravasated from the broken Thred of Circulation, it gathers together into a Tumor; and because from this kind of tumor an heat and pain are increased in the part, the Blood is more disturbed in its motion, and so the Fever, at first inkindled, is more aggravated.

Further, in these kind of Distempers, we may take notice of a certain aptitude of the Blood to be coagulated, whereby it is made less fluid, so that it is apt to be congealed in the lesser Vessels, even as it is to be perceived in Milk, when it begins to fowr, for then it will not be boiled, nor heated over the fire, without coagulation: and in like manner, there is to be suspected in the Blood, a certain disposition to growing fowr, by reason of which, it is made more obnoxious to coagulation; for it easily appears, that in a Plurisie, a Peripneumonia, the Squinancy, and the like Diseases, the Inflammation, or Extravasation of the Blood, does not always depend on the exuberancy of the Blood, and plenitude of the Vessels; for oftentimes the Blood is stopped in its motion, with a weak Pulse, and a sinking down of the Vessels, and being extravasated in the side, or elsewhere, causes a most acute pain, yea being driven from one part, by and by it is fixed in another; and sometimes it begins to stagnate in the Heart it self, and there oftentimes induces a deadly oppression: wherefore, some pluritical people, are wont, when the pains are gone, to complain of a great burden, and as it were weight, fixed about the Region of the Heart: And when we have opened the dead Bodies of such as have died of these kind of Diseases, we have seen the Blood to be gathered together, in little bits, or oblong gobbets, in the secret parts of the Heart, and round about the cavities of the Vessels. But for that these Diseases are wont to be handled apart from the Fever, therefore we shall say no more of them here.

It only remains, that we enquire, whether the Fever which accompanies these Distempers, is to be esteemed in the rank of those that are called putrid, or not? To which we reply, that most often they are simple Fevers, in which only a subtil and spirituous part of the Blood is inflamed; and therefore if the extravasated Blood may be restored to Circulation, by a plentiful detraction of the Blood, or an emptying the Vessels by Sweat, presently the growing hot of the Blood is appeased, and the Fever shortly allayed. But sometimes, when a predisposition, as in a Plethora, or fulness of good humor, or in a great Cacochymy, or fulness of evil Juices, brings it on, together with the same kind of Distempers, a putrid Fever is inkindled, wholly from the same Cause.

Among

Among the Symptomack Feavers, is reckoned that which is commonly called the flow Feaver; they who are sick of this, are more than usually hot, especially after eating, any motion, or exercise; the Urine for the most part is red, the Spirits are feeble, and strength cast down; as to their Appetite and Rest, they are indifferently well, they have neither Cough, nor much Spitting, but they daily (like those in Consumptions) grow lean without any evident cause. The fault for the most part is ascribed to Obstructions in some Inward (as the Liver, Spleen, or Mesentery) by whose default the Aliment is not well Cooked, nor rightly dispensed. But it seems to me, that this sort of distemper is immediately founded in the evil disposition of the Blood, by which it is inclined into a too salt and sour temper, and therefore is rendered less apt for nutrition and an equal Circulation. For the Blood in the Heart, just like Oil in a Lamp, if it redounds too much with saline Particles, is enkindled not pleasantly and equally, but with a noise, and great evaporation of the parts; whereby indeed, it is sooner wasted, and exhibits but a languishing and weak flame. I opened one, sometime since dead of this Disease, in whom the Viscera destinated to Concoction, were well enough, but the Lungs were without moisture, and dry, and beset throughout with a sandy matter like Chalk. Also oftentimes, in this Disease, the Mesentery is beset, the Glandules being filled with such a Chalky matter: but whether the Blood being made more saltish, doth first bring in these kind of Distempers of the Viscera, or whether the Dyscrasie, or evil disposition of the Viscera, first brings it upon the Blood, is uncertain: it seems probable, that either Distemper depends upon the other, and that the causes of either evil are reciprocal.

But the Feaver, which chiefly deserves to be called Symptomatic, is that which is excited in Phthisical persons, from an Ulcer or Consumption of the Lungs. For the whole Blood, whilst it passes through the Lungs, in its Circulation, often impresses on this Inward, the Ideas of very many Diseases; and on the other side, receives the same from it, being evilly affected, whatsoever impure thing is contained in the Mass of the Blood, as the flowing of new Wine, is cast forth by extremities of the Arteries; wherefore, when Nature being made more weak, it cannot transfer its recrements into the superficies of the Body, it deposes them by a more near Purgation into the Lungs. From hence a Cacochymia, or fulness of ill Juices, and many Chronical Diseases end in a Consumption: in like manner, when the flesh of the Lungs wastes, or abounding with an ulcerous Matter, becomes pale putrid, the Blood passing through it, is infected with the purulent matter, or tabid infection, and for that cause, is stirred up into a continual Effervescency, by reason of the confusion of something not miscible, and wherefore it induces an assiduous Feaver, and wholly perverts the Alible Juice. The same reason is of Feavers, from an Ulcer or Imposthume, oftentimes raised up in other parts; for these, even as the tabid constitution of the Lungs, cause oftentimes a Consumption and Hectick Feaver. The full consideration of these are not for this place; wherefore we will return whence we have digressed, to a Putrid Feaver properly called, or essential,

The Essential putrid Synochus is wont to be divided into a putrid (such as is already described) into a Causton, or hot burning Feaver; and besides into a Quotidian, Tertian, and Quartan: The putrid Synochus, but now delineated, ought to be the rule or square of the rest, to whose Type most Feavers, which are of this kind, are to be composed. As to the rest, but now mentioned, according as they vary their kind, I shall briefly subjoin.

The Causton, or burning Feaver, is that which performs its course with a greater heat, almost intolerable thirst, and other Symptoms, arguing a greater inflammation of the Blood: The formal reason of it, by which it is differenced from the rest, consists in this; that the temper of the Blood is hotter, that is, abounds more with fireable Sulphur; therefore, when it grows fervent, it is enkindled in a greater plenty; and with its deflagration, diffuses the *Effluvia* of a most intense heat, through the whole Body: its motion is acute, and quickly comes to its standing; it is compassed about with more horrid Symptoms, hath a difficult Crisis, and an even full of danger.

But as to what respects those periods or fits, in which a putrid Feaver sometimes is wont to be more cruel at a set time; and (as if intermitting) now every day, now every third or fourth day, repeats as it were the Feaverish fit; the reason of this seems not easily to be explicated; especially if we reject from this cense the fewer humors, to the spontaneous motion of which, this Distemper is commonly ascribed, concerning this matter, what seems most likely to me, I shall doubtingly propose. In a continual Feaver there are two chief things (as we have already noted) which for the most part induce the Effervescency of the Blood, to wit, the exaltation and enkindling of the Sulphureous part of the Blood; then consequently an heaping together of the adust matter, and remaining after the burning of the Blood, to a swelling up: upon the former a continuance of the Feaver, upon the other, its standing, and critical perturbations depend: To these sometimes, a certain third thing happens, to wit, a fulness, and swelling up of the crude Juice, from the Aliments newly taken, which in a continual Feaver (as in the fits of intermitting Feavers) induces a great Effervescency at set intervals of times. But why this does not always happen, nor wholly after the same manner,

the reason is this ; when the putrid Synochus is very acute, and the whole Blood almost is quickly inflamed, and highly rages, whatsoever of nutritious Juice is poured to the blood, is presently burnt and consumed by the fire ; wherefore little or nothing of it is contained in the mass of blood, for the matter of a fit. But if this Feaver be less acute, and the blood only flames forth moderately, and in parts, the supplement of the crude Juice is not wholly consumed by the burning ; but is perverted by a more gentle fire, into a fermentative matter, which, when it arises in the Vessels to a fulness of swelling up, conceives a Flux, and by its Effervescency, makes stronger the Feaverish heat, before glowing in the blood, as it were by the coming of new Fuel. The flowing of this matter doth not seldom begin with a light shivering, or cold, and sometimes end with sweat ; but for the most part, it is exhaled by insensible transpiration. In every fit, besides the provision of the degenerate nutritious Juice, something from the adust, and burnt matter of the blood, evaporates ; wherefore the Crisis of the Disease is drawn forth longer, that 'tis hardly cured, under eleven or fourteen days ; yea (for the most part) in this sort of Feaver, with fits and remissions coming between, the perfect Cure of the Disease happens scarcely within twenty days ; and sometimes leisurely, without any through Crisis, it remits, and then by a long declination, it is ended in Death, or Health.

But that this kind of remission and acerbation or growing more violent, are varied, according to the type of an Intermitting Feaver, that they repeat their turns now every day, now every other day, and sometimes not but within four days, the reason of this is to be sought, from the Doctrine before delivered, of Intermitting Feavers ; to wit, that according as the Dy-crasie of the Blood diversly appears, the supplement of the degenerate nutritious Juice, arises to the fulness of swelling up, either sooner or later ; and for that reason, its Effervescency causes now more frequent, now more rare fits in this Feaver.

Concerning the Cure of putrid Feavers, of every kind, there are four general intentions, on which the whole stress of the matter depends.

First, That the Blood (if it may be done) may be defended from burning, and the flame, or fire enkindled in its Sulphureous part, be wholly suppressed ; which about the first beginning of this Disease, happens to be brought often about.

Secondly, That when the Blood having taken fire, cannot be presently extinguished, that at least it may perform its burning more mildly, and with lesser hurt.

Thirdly, The deflagration being ended, that the Liquor of the Blood be freed from the re-crements of the adust and burnt matter, and afterwards restored to its natural Temper and Vigor.

Fourthly, That the Symptoms chiefly troubling may be timely helped, the which, unless taken away, will frustrate the work both of Nature and Medecine.

As to particular Remedies, with which these intentions may be served, there are various prescriptions, and forms of Medecines, not only among Physicians, but also among old women and Emperics, ordinarily in use ; from which, however, like a Sword in a blind mans hand, used without difference, and exact method of healing, more hurt than good, most often accrues to the sick. There will be no need here to repeat the forms of Purges, Cordials, and of other Medecines, elegantly enough delivered among many Authors : I will add in few words, some chief indications, and Medical Cautions, which ought to be observed in the course of this Feaver, according to its various times, and divers symptoms.

1. At the first beginning of this Disease, the business will be, that the Feaver may be presently suppressed ; and the inflammation of the heated Sulphur may be inhibited ; to which, the opening of a vein doth chiefly conduce ; for by this means, the Blood is eventilated, and the heated Particles, too much heaped together, and almost ready to be fired, are dissipated one from another : as when Hay, apt to burn, if exposed to the open Air, its firing is prevented. Besides, let a slender Diet be instituted, in which nothing Spirituous or Sulphureous ought to be administred : The Viscera, and first Passages should be freed from the load of excrementitious matter ; wherefore Clysters are of necessary use ; sometimes also Vomits and gentle Purges ; by which, sometimes timely and with Judgment administred, the Feaver presently after the beginning, is extinguished, the food of the fire being drawn away. If that notwithstanding this method the burning spreads more abroad, and more and more, daily snatches hold of the Sulphureous Particles of the Blood ; it must be endeavoured (as much as may be) that the deflagration proceed gently, without great tumult.

2. When the Feaver is augmented, if the Blood be too hot, and distends the Vessels very much, with a vehement and strong Pulse ; if Watchings, a Phrensie, or a pain of the Head cruelly urge, the letting of Blood may be again repeated ; Transpiration (as much as may be) should be freely procured ; wherefore let the sick keep in bed for the most part ; let the Diet be sparing, of the most slender Aliments, also Drink small, and plentiful, that the burning blood may be diluted with a more plentiful Serum : Clysters are administred safe enough, and in truth commodiously ; but Medecines, whether Catharticks, or Diaphoreticks, and which too much exagitate the Blood, are to be shunned, with the same industry, as Blasts of Wind to burning Houses ;

Houfes; but rather Opiats, and Anodines which fix and bind up the Blood and Spirits, are to be made use of; also Juleps and Decoctions, which refrigerate the burning Viscera, attemper the Blood, and cherish the Spirits, are often to be exhibited; acetous Liquors of Vegetables, or Minerals, also putrified Nitre, because they restrain the rage of the Blood, and extinguish Thirst, are truly convenient. Hot Waters, and Spirits, Cordial, and Bezoartick Powders (so long as the Disease is not malignant) are not to be meddled with. If that the Blood be unequally circulated, and is carried more towards the Head, than the Feet, Epithema's are Profitable, of the warm Flesh, or Inwards of Animals, applied to the Soles of the Feet.

3. When the Fever is at its standing, the motion of Nature is diligently to be attended, whether it will make a Crisis or not; wherefore nothing rashly is to be attempted by the Physician; the opening a Vein, or strong Purgation, is wholly to be forbid; but after that the Feverish burning is somewhat remitted, from the deflagration of the Blood, and signs of Concoction appear in the Urine, if that the motion of Nature be slow, a Sweat, or gentle Purge may be admitted; which however, are better and safer done by the Physician, when Nature first, by a critical motion, hath entred upon the seclusion of the Morbifick matter. If that all things are crude, and troubled, the Urine yet turbid, without sediment, or separation of parts, if the strength be languishing, the Pulse weak, if there be no Crisis going before, or only in vain, any evacuation, either by sweat or Purge, is not to be attempted, without manifest danger of Life, but it must be longer staid for, that the Spirits of the Blood may recover themselves, may by some means overcome the excrementitious and adust matter, and then by degrees may separate it, and put it forth; in the mean time, the Spirits are to be cherished, with temperate Cordials; the immoderate Effervescency of the Blood (if it still be) is to be stopped, and its due fermentation sustained, which in truth is best performed by Corals, Pearls, and such kind of Powders; which indeed are dissolved by the Ferments of the Viscera, and then ferment with the Blood, and greatly restore its weak and wavering motion. In the mean time (whilst Nature is labouring) all obstacles and impediments are to be removed, and especially the provision of Excrements, heaped up in the first passages, is to be brought away, by the frequent use of Clysters.

4. By what way or method, the Symptoms chiefly urging, ought to be handled, will not be easily prescribed by certain Rules; because they themselves require sometimes to be presently appeased and quieted, and sometimes to be quickned forward: and what is something more; perhaps at another time, they are to be left wholly to Nature. Some of these are to be opposed with gentle and lenitive Remedies, but others with more sharp and irritative Physick: yet in the mean time it is a precept to be held in all, that you diligently wait upon the footsteps of Nature; which if it works wrongfully, its disorder is to be reduced; if rightly, yet too vehemently, to be bridled: If she works rightly, yet too slowly, or more weakly than she should, the business will be, that her endeavour may be incited, and helped, by the help of Medicine.

5. In the declination of the Fever, when after a perfect Crisis, Nature is stronger than the Disease, the business goes well, nor is there much business left for a Physician: It only remains to propose an exact manner of Diet, that the sick may soon recover strength, without fear of relapsing: also it is requisite to exterminate the Reliques of the feverish matter, with a light Purgation. About Diet, they often fall on the Rock of Relapsing, viz, by the too hasty eating of flesh-meats, or more strong food, the sick relapse into the Fever; for when the Viscera are weak, and the Aliments (unless very slender) not easily digested, and when also the disposition of the Blood is weaker, that it does not assimilate the more strong nourishing Juice, if any thing impropportionate is brought to either, the Regiment of Nature is again perverted, and all goes ill. Wherefore, those growing well, should for a long time refrain from flesh, and when at length they use it, it should not be unless the Urine shall be like that of healthful people, and no more troubled by the cold; and then indeed it will be safest to begin with Broths made of Flesh, and then by degrees, to proceed to more strong Aliments.

6. When from an imperfect Crisis, things are grown doubtful, and remain yet undetermined; then is the Physicians most difficult Task: The motions and strength of Nature are carefully to be waited on, whether it begins to prevail on the Disease, or to yield to it: If signs of concoction appear, and that there is strength, a gentle evacuation, and only by leisure, is to be celebrated. In the mean time, the Symptoms most urging are to be succoured with convenient Remedies, all impediments to be taken away, and strength is to be sustained (as much as may be) with Cordials, and a right manner of Living or Diet.

7. When from an Evil, or no Crisis, all things turn to the worse, and when the Physician almost despairs of curing the Disease, he may predict its event suspected, and much to be feared. But yet, he ought not to trust to a naked Prognostication, to hinder all things else, but that as yet, what is in the Medical Art, should be consulted for health, though desperate: Remedies may be administered to the Symptoms most infesting; the Spirits of the Blood almost extinct, may be restored by Cordials. When we despond of Health, Life should be prolonged as long as may, and at least a fair Exit procured.

According

According to the various types but now described, of a Putrid Feaver, I might readily add very many Histories of sick people, and particular observations, made about their Cure; for for these kind of Examples are usually met with in our daily practice, so that they are sufficient to fill a great Volume; out of these however, with the good leave of the honest Reader, I will briefly propose some few, respecting the several kinds of the aforesaid Feaver, by which their Doctrine, and Method of healing them, above delivered; may be illustrated.

A Noble Matron, about fifty years of Age, of a slender habit of Body, little stature, indued with a ruddy complexion, when on the fifteenth day of *June*, by reason of the Summers heat, she had put on more thin Garments than she was wont, felt her self ill in the Evening; from thence she was distempered with a nausea, and oppression of her stomach, she felt wandering pains, troubling her now in her shoulders, now in her back, very thirsty, yet without any immoderate heat: on the second, and third day, almost after the same manner, on the fourth day after a Vomit, viz. of the infusion of *Crocus Metallorum*, one Ounce given, she cast forth yellow bile four times, and had three Stools, and seemed to be eased, the night following, she slept something better: but on the next day, the Feaver being thoroughly inkindled, she complained of thirst, a burning of the Præcordia, and of a pain, now in her side, now in her back; presently blood was taken to eight Ounces, her Urine was of a very deep red, thick, and troubled without any Hypostasis, or settling of the Contents, her Pulse unequal, and often intermitting, the following night without sleep: on the sixth day of the Disease, early in the Morning, a small Sweat broke forth, from whence the heat something abated, which in the Evening again grew stronger: on the seventh day, a very acute heat, with thirst, burning, an inordinate and intermitting Pulse, as also with a mighty restlessness, and tossing of the whole Body troubled her, on the eighth the symptoms were somewhat more remiss; also in the Urine, some marks of an Hypostasis; she took that day Posset-drink, with Meadow-sweet boiled in it, and sweated plentifully; and was cured of her Feaver. All the time of her sickness, for Food they gave only small Beer, Posset-drink, Barly-Broth, or Grewel, also frequently Clysters; Drink, and a cooling Julep, they gave her at her pleasure.

This Noble Lady, through transpiration being hindered, fell into a putrid Synochus: the Effluvia, wont to be evaporated through the Skin, being retained within (together with the Choler flowing out of the Cholerick Vessels) and fixed to the Viscera, did overthrow the dispositions of their parts, and especially gave trouble to the Stomach, and raised up pains and Convulsions in the parts filled with Muscles and Membranes: the Pulse was unequal, and intermitting, not because of the malignity of the Disease, as in the Plague; but by reason a certain proper disposition of the Heart, by which indeed, its ferment being not well constituted, the Blood growing fervent, is not presently equally enkindled, and wholly leaps forth, but a part of the Blood, in flowing in a small, then a greater, and after some turns, the greatest proportion, stopping for a moment of time, in the bosoms of the Heart, produces the unequal or intermitting Pulse. I have known in many others, clearly, the like Distemper of the Pulse; to wit, so long as they were free from intemperance, the Pulse was altogether equal and orderly, but if they were more strongly heated than usually, by any sudden passion of the mind, or too great agitation of the Body, presently they were affected with an unequal Pulse, and between the vibrations or strikings, intermitting perhaps 4, 7, 10, or 20. and as often as they fell into a Feaver, the Pulse shewed it self after this irregular manner. When this habitual irregularity concerning the Pulse, was not yet made known to me, by frequent experience, I was wont to suspect still a malignity in the Disease, and to foretel a fatal event, which happened otherwise.

On the fifth day, in this sick person, the Feaver, although slowly enkindled, came to an augmentation, and from thence pass'd through the rest of the stations with a swift motion; on the sixth light emptying of the adust matter, arising to a fulness, a Sweat being risen, and so a certain remission of the Feaverish heat followed: on the seventh day, this adust matter arising to its height of increase, made the standing of the Disease, to which, at length on the eighth day, a plentiful Sweat, with all things requisite to a good Crisis, followed, and perfectly cured the Feaver: because (as it ought to be) those three things went before this critical evacuation, viz. first a full and sufficient deflagration of the Blood, as appeared by the very strong heat, and plainly fiery, continued for three days before; also secondly, a congestion of the adust matter to a plenitude, as was collected by the high disquiet and tossing about the preceding night: and then a certain Pepasmus or Concoction of the same matter, and a begun secretion in the Blood, which a ceasing of the Symptoms and Signs of Concoction in the Urine, shewed; wherefore, the copious Sweat, coming upon so laudable a sign, so long as there was no suspicion of malignity, portended nothing but good.

About the beginning of the year 1656, a Gentleman endued with an active habit of Body, without any manifest cause (unless that being much addicted to study, he used no exercise after it) became ill; at first he complained of a nausea and want of Appetite, with a great Head-Ach, on the second day he was affected, now with a shivering, now with heat, several times reciprocating; besides, with thirst, and burning of the Præcordia, with a scurfulness of the

Tongue,

Tongue, and an ingrateful savour. On that day, he took ten drams of an Emetick Liquor, by which he vomited seven times and cast up a great quantity of yellow bile, and had four Stools; the night following he was unquiet, and almost wholly without sleep, and in which the sick person grew more Feaverish, with an increased heat: on the third day, when the aforesaid Symptoms were grown worse, he was let blood to ten ounces; his Urine was red, thick, and with a copious sediment; his Pulse quick, and vehement; at night he sweat a little with a short sleep, but disturbed: on the following morning, he seemed to be a little eased; yet in the evening all things grew worse, with most strong wakings, heat, and thirst: on the fifth day, by a light Sweat, the heat somewhat remitted, which yet a little before the Evening, returned with its wonted fierceness. The Night again was wholly without sleep, with a continual tossing up and down of his Body. In the Morning, by a little gentle Sweating, he felt a little ease; in the Evening an increase again of all things more cruelly; the night also was very unquiet: about the beginning of the next day, a Sweat, as before succeeded, and a little more plentifully: on this day was a manifest change towards Health; the heat and thirst was a little less vehement, his Urine was less red, with some Hypostasis; thence, for three days, the Fever leisurely declined; yet every night he had a certain fit, but more remiss than before; on the eleventh day, he sweated more plentifully, and was perfectly cured: all the time of his Sickness, he used a most spare diet, taking truly nothing of Aliment, beside small Beer, and Posset-drink made of it; he sometimes took Drink and cooling Juleps of boiled Barly, and distilled waters; daily, if his Belly was not loose of it self, an emollient Clyster was administered: he used no other Physick besides, no wit, neither Purge nor Cordial. But the Fever being allayed, he was twice Purged, and from thence quickly well.

This Fever was a putrid Synochus, as may be conjectured by the shivering about the beginning, and then with continual heat, thirst, watchings, and other Symptoms grievously infesting for many days: but forasmuch as its intemperature was exasperated every night, it might be called a continued Quotidian. This Disease made its first assault without any evident cause, because the Blood being little ventilated, like Wine growing hot of it self, had conceived an ardour, from the exalted Sulphur; the Choler flowing forth from the Choleduct Vessels, and likewise the Purgings of the raging Blood, being poured about inwardly (as it is wont to do for the most part in Feavers) presently stirred up troubles and disorders in the first passages; therefore by reason of the excrementitious matter there heaped up, there was procured a depletion, and soon after the beginning, a Vomiting: notwithstanding which Evacuation, and likewise a more strong purging of the Belly by Stool, if administered, the Fever being wholly inkindled, because they too much agitate the Blood, and disturb greatly the Concoction of the adust feaverish matter, for that reason bring more damage for the most part, than benefit to the sick: The first station of this Disease, viz. until the whole Blood was fired, was extended to the third day; and then from thence, when the Blood flaming forth, was burdened with adust recrements, its greater ebullition, with a frequent endeavor of expulsion by Sweat, followed, on the seventh day, when the Blood for the greatest part had flamed forth, and the adust recrements, heaped up in its bosom to a fulness of swelling up, began to be troublesome, the critical motion was stirred up; by which nevertheless, that matter not being as yet wholly subdued, nor ready for separation, the Disease was not perfectly cured; but after another period, the same increasing, at last being stirred up, on the eleventh day, brought on that other, and perfectly curing swelling up: in the days between, because, besides the recrements remaining after the delagration of the Blood, and reserved for a Crisis, also from the Nutritious Juice not presently taking fire, but after a peculiar manner depraved, other matter in the bosom of the Blood, apt to a swelling up, was gathered together; therefore, from the continual increase, and Flux of this, there hapned to this Fever continual fits (such as are wont in intermitting Feavers) on set days and hours.

A studious young man, about twenty five years of Age, of a dark Countenance, and Melancholic temper, without any manifest occasion, began to be sick, in the Year 1656. At first he complained of a Feaverish Distemper with thirst, a spontaneous weariness, and want of Appetite; moreover, on the second day, of a pain in his right side, and a distention of either Hypochondrium, also with almost continual Vomiting, Wakings, and very great pain of the Head; a Physician being sent for, he was presently let Blood to twelve ounces. In the Evening he grew more hot, and was light-headed; afterwards, a Sweat, though small succeeding, he was better the next Morning: on the fourth day again, he cast up whatever he took presently; also he was troubled with an almost continual endeavour of Vomiting. The exhibition of a Vomitory Medicine, proposed by the Physician, both the sick person, and also his Friends, taught by the danger of it before, rejected. From a Clyster given him, he had six Stools, and seemed to be a little alleviated; also the night following he slept somewhat: on the fifth day he again fell into frequent Vomiting, with intolerable Thirst; he burnt inwardly, but outwardly could not be felt any immoderate heat; because the recrements of the effervent Blood, which ought to exhale through the Skin, seemed to stagnate within, and to flow

flow forth into the Viscera. Therefore in the evening this Bolus was given him, to provoke Sweat. Of Conserve of Roses Vitriolate one Dram, of *Gascon's* Powder one Scruple, of Laudanum soluted in Balm-Water one Grain: that night he slept moderately, and by a copious sweat following, the Symptoms seemed to be mitigated: nevertheless on the sixth day, all things again were imbibtered, and a through heat, thirst, and burning of the Præcordia, cruelly tormented him; on the seventh and eighth day, the Pulse was unequal and disordered; for the most part he talked idly, and if moved in his Bed, he fell often into a Swoon. On the ninth day, the same Symptoms stopped, also he was troubled with a contraction of the Tendons in his wrists, and convulsive motions of other parts, that we almost despaired of Life. Because that morning Nature seemed to be given over as conquered, she was now to be succoured, with whatever remained of Art: Wherefore intending a more copious Sweat, as the last Refuge, I gave him a Dram of Spirit of Harts-horn, at one time, in a small draught of Cordial Julep; upon which, being for four hours very unquiet, and furious, he could scarce be held in his Bed: but afterwards Sleep creeping upon him, he sweat very much, and the business suddenly came to be out of all danger. On the following night, for the continuing of the Sweat, I ordered to be given him, every six hours, a dose of the Powder of Contrayerva, the Fever, and the Distempers of the Nerves shortly ceased, and the sick person became well.

This Fever, as to the manner of its Figure, may be called a putrid Synochus; which, in this sick person, from the Blood being made hot of its own accord, like Hay heating, and so conceiving an immoderate Fermentation, took its original: by reason of the Melancholick temper of the Blood, the heat was less strong, although the Symptoms were otherwise worse, and happened to be chiefly inimical to the nervous stock; for the Blood burning forth, as Fire in a Furnace, covered with Chips, glowed with a most intestine burning; therefore the sick complained of the heat of the Præcordia, with an intolerable thirst, when in the mean time, the exterior parts were but little heated: for this reason, and because the Body was less perspirable, the adult recrements of the Blood being about to make a Crisis, and which were wont to be dispersed outwardly, at set times, being suffused inwardly (Nature being very much oppressed, and perpetually provoked) brought on cruel, and almost continual Vomiting; wherefore, when the Feaverish matter was derived to the first passages, by so frequent an endeavour of its expulsion, before the fulness, or concoction, no Crisis followed thereupon. Nor was the sick man the better for that irregular evacuation; yea, the Blood being still made worse in its mixture, began to be corrupted in it self, and wholly to pervert the Nervous Liquor; from whence, besides the assiduous Vomiting, frequent Swoonings, unequal Pulse, also Deliriums, and Convulsive Motions did arise; but so far as the mixtion of either humor and disposition, being not yet wholly loosened, or overturned, the Diaphoretick was administered, which by reason of its great agility, quickly pass'd through both the Blood, and the Nervous Liquor, and a lively and hasty Fermentation being raised up anew, carried forth of doors their impurities and extraneous mixtures; the state of the [Disease tending towards Death, was reduced to Health, and by this means, instead of a Natural Crisis, by the help of a supplying Medicine, the sick man, as it were recalled from the dead, quickly recovered Health.

A Woman, being about thirty years old, of a strong Body, and Melancholick temper, (as might be gathered by her very austere manners) in the third month after her lying in, got cold in giving her Child suck, and uncovering her self, and upon it fell presently into a shivering. To this, a heat more increased than usual, followed, which afterwards (a light Sweat arising) quickly remitted. On the second and third day, she was very thirsty, and without appetite to Food, yet without immoderate heat, that she could scarce believe her self in a Fever: She lay quiet every night, but wholly without sleep; her Urine was highly red, and with the multitude of Contents, thick and cloudy, which however not troubled by the Cold, remained still after the same manner, without Hypostasis, or sinking down of the parts. On the fourth day, the heat was inkindled throughout the whole; wherefore a Physician being then first sent for, about 12 ounces of Blood was taken from her Arm; after the letting of blood, and her Belly the same day copiously emptied, by a Clyster, in the evening she fell into a Sweat, by which nevertheless she was nothing eased, and (though an Anodine Medicine was given her) she wore out the whole night (as before) without sleep. On the fifth day, from a Clyster being given, she had three Stools, and felt some ease: her Urine still remained red and troubled; when Blood was prescribed to be taken from her Ham, the sick obstinately refused, esteeming her self to grow well: on the following night, when she had lain long without sleep, and unquiet, she at length was troubled with a fit, such as is commonly called Hysterical, after a grievous manner; and at first, with a certain numbness or sense of pricking possessing the extrem parts of her body (especially her feet, thighs and legs) she was affected; and together with a Wind cruelly distending the Intestines, Ventricle and Hypochondria; she felt in the bottom of her Belly, as it were a certain bulk to creep upwards, which when it had ascended to the Heart, and thence to the Brain, the sick Woman presently was weakned in her Intellectuals, and all the night lay talking extravagantly and idly. On the sixth day, after her Belly was taken down by a Clyster, she returned to her self, and remained

remained in her right mind, and seemed to be indifferently well. But in the Evening when she was moved in her bed, she began to feel the same kind of fit as before, to wit, she had a sense of pricking, as if stung with Nettles, in all her body, together as it were a round thing roul- ing about in her belly, which creeping upwards; distended the Intestines and Ventricle, that she emitted by means of it blasts, and belchings: for ease sake, she required a draught of cold Water. Moreover, the Remedies usual in hysterical Distempers, as Castor, the smell of *Assa fetida*, the fume of burnt Feathers, Ligatures, and Frictions of the Legs, and the like were administred, by the use of which, she seemed for the present, free from the aforesaid Distemper, and was wholly without it for four hours: but when she lay upon her back in her bed, as she had settled her self to sleep, on a sudden she complained, that the same Symptoms, did at once run through her whole Body, and by and by, she fell upon it into a Delirium; houl- ing and crying out, she talked idely the whole night; the day following, her eyes being open, she lay without speech or motion: again in the Evening, when her Fever being increased, she grew furious, that she could scarce be held in her bed: and so she remained for three days, now delirious, crying out, and wailing, now as it were stupid, without motion, or voice; yet still she was tormented with Convulsive motions, about the tendons of the muscles: on the tenth day, she drew her breath deep, and difficultly, with a weak, and as it were a creeping pulse, and about the middle of the night died.

This Fever was of the rank of the Putrid Fevers, which nevertheless, by reason of the melancholic disposition of the Blood, (as we before intimated) was not very grievous, with heat or burning; but yet being very much infestous to the Brain, and nervous stock, was more difficult to be cured: The Blood being predisposed to a growing hot, easily contracted the Dis- temper by taking cold, but yet, from the salt, and earthy feculencies, together with the Sul- phur being moved, it was not openly inflamed; nevertheless, burning with an intestine, and as it were shut up fire, it was more notably depraved: Hence, presently from the beginning, the Urine was highly red, and troubled, also she continued wholly without sleep: on the fifth day, the Blood burning forth, and being filled with the recrements, or adust matter, was irritated by its plenitude to an endeavor of excretion; wherefore, this night, a swelling up being arisen, it transferred its load, not dispersable by sweat, into the head, and there affixed it to the Brain, and nervous stock: From thence, presently, the wonted irradiation of the animal Spirits, being disturbed in the fountain it self, their inordinations first hapned to be felt in the extream parts; wherefore, there was a pricking in the whole Body, the Belly inflated, the Hypochon- dria distended, and as it were a certain substance, or live thing, ascending upwards, and suc- cessively running through the Belly, Precordia, and at length the Head: For these kind of Symptoms, arise not (as it is commonly believed) always from Vapors, lifted up from the Womb, and striving or thrusting upwards: but, not seldom, from the Brain, and the begin- ning of the Nerves being distempered: for, when the evil is there inflicted, that the animal Spirits nigh their origine, are disturbed in their motion, neither (as before) blow up, and distend the nervous Bodies, presently the other Spirits, implanted in the extremities of the Nerves, being deprived of their wonted influence, begin to tumultuate, and being moved in- ordinate, and towards their beginnings, cause Convulsions in those parts in which they dwell. This irregular, and Convulsive motion, begun in the extremities, by the continued passage of the Spirits, and of the nervous parts, creeps by and by into other parts, and then to others, still to those neerer to the Brain, till at length, (the whole series of Spirits, like Souldiers, being carried successively backwards) the Convulsions are continued, into the foun- tain it self of motion; So as in truth, by this means, the Convulsive motions, are sometimes begun, a most long way, from the cause, or place of the Distemper, as by this only argument plainly appears: to wit, as often as the influx of the animal Spirits, is inhibited in the Leg, or Arms, by a strict Ligature, or by leaning hard on them, a sense of pricking, or a cramp, with a numbness, is felt, first in the Foot or Hand, which afterwards successively ascends towards the affected part: wherefore, in this sick Woman, by reason of the Feaverish matter, (to wit, the adust recrements) fixed on the Brain, by a critical translation from the bosom of the Blood; and there besetting the beginnings of the Nerves, those Symptoms, imitating the hysterical distem- per were stirred up: by reason of the Nerves, (which are dispersed through the whole Body, by means of the Spinal Marrow) being distempered near their original, the sense of pricking begun in the extream parts, by and by is perceived in the whole. By reason of a like hurt, of the sixth pare in the fountain, Convulsions and Distentions arise, first in its little branches, most thickly set about the Abdomen: That ascent, as it were of a certain substance, was only a tume- faction of the Viscera, and Muscles, successively inflated or blown up, by the Convulsion; from thence, the same Distemper (by the mediation or coming between of the branch of the same sixth pare) creeping along more upward, and still more near the Brain, the Precordia, and then the Head it self, (as by a certain Vapor raised up from beneath) seemed to be taken; on the next day, when this Feaverish matter, at first lightly fixed in the Brain, was at length again amended by the Blood, the aforesaid Symptoms ceased for a time: Then soon after (the Blood

again flowing, and depositing its Recrements again in the Brain) the same kind of Distemper as before, this sick Woman felt to come upon her; which however, with rubbings, the smell of stinking things, and other Remedies used in the hysterical passion, was retarded for four hours, from its assault; to wit, so far as the animal Spirits, being tired out by the external object, and irritated into a violent motion, were hindered, that they could not so suddenly conceive Convulsive motions: but afterwards, when that incitation of the Spirits, outwardly exhibited, did cease, the morbid cause still troubling, those Spirits being grievously beset, not successively (as before) beginning at the extremities, but on a sudden, all, both in the Brain, and the nervous appendix, were at once acted into confusion. The Crisis being after this manner attempted, viz. By the translation of the Feaverish matter to the Brain, the event of the Disease, both in this sick Woman, and also in others, whose sicknesses I have diligently observed, for the most part hath a mortal success. For the Blood, unless extremely depraved, and hindered, scarce ever endeavors to purify itself, by such a Crisis: and as often as it endeavors an excretion by this means, it inflicts on the Brain, and nervous stock, an evil, not quickly, nor easily to be blotted out: also, the mass itself of the Blood, very rarely, by the motion of such a flowing, is rendered free, from the impure mixture of the Feaverish matter.

A learned young man, of a lean habit, and pale countenance, in the coming in of the Spring, being conscious of no error as to his dyet, began to complain of a weariness, and impotency in walking, also of a drowsiness, and sleepiness of his head: on the second day also, he was tormented with thirst, want of appetite, and an heat of his Precordia: on the third day, the Physician being sent for, he took a Vomit, by which, when he had Vomited three times, and cast downwards five times, cholerick and hot matter, he became somewhat chearfuller, and the night following slept indifferently well: on the fourth day, he bled a small quantity; then his thirst, and heat very much increased: his Urine was red, with a copious sediment, and a little hypostasis. But because, after the signs of concoction in the Urine, the endeavour of Nature, as it were oppressed, appeared for separation, without sufficient evacuation, therefore he was let Blood to seven Ounces, and he seemed thereby to be very much eased, yet in the evening, all things grew worse, and then for three days, the Feaver seemed still to be increased: on the seventh day, he complained of a great heaviness in his head, and of a darkness, turning about in his eyes: after noon, an hemorrhage or bleeding copiously followed, that for the great loss of Blood, the sick person had almost lost all his strength, and there was a very great necessity of medicinal help to stop the Blood: For this end, when a Vein in his Arm was opened, Ligatures, and proper Medicines were applied, both to his Head and Belly, and very many other Remedies (the occasion of hasty curing urging) prescribed by every body, were tried in vain; at length, by the persuasion of a Woman, coming there by chance, a red hot Iron was held to his bleeding Nose, and on a sudden, from the Vapour of the burnt Blood, received into the Nostrils, its Flux was stayed. This Remedy, I afterwards knew used to many, with very good success. This great Hemorrhage cured the continual Feaver, to which nevertheless, an intermitting Quotidian followed, which afterward was quickly cured, by the method of curing already delivered.

This Feaver, beginning without any manifest occasion, and continued for many days with thirst, and heat, may be called a Putrid Synochus; which yet without any horrid Symptom, about the beginning or standing, was cured by an easie course, tho' at length by a dangerous and difficult Crisis: The turgescency of the Blood in the Spring-time, and together the defect of ventilation in the same, gave the beginning to this: The Blood burning out, with a Feaverish fire, about the fourth day, had heaped up something of adust matter; that flowing it attempted a critical motion, tho' with a small hemorrhage: The defect of a more full evacuation, the opening of the Vein supplied for a time, afterwards, the adust Recrements being heaped together, in great plenty, the same being not apt to be dissipated by sweat, in a body not rightly perspirable, at the time nature was about to endeavour a Crisis, a mighty bleeding followed. For when the Blood, by reason of the seclusion of the Feaverish matter, is agitated with a critical motion, very many of its Particles are loosened from the mixture, so that a greater swelling up being provoked, they carry forth every extraneous thing confused with them: if at this time, the breathing places of the skin, be but little open, the mass of the Blood (as new Wine stopped up in a bottle of a small mouth) even more notably grows turgid, and because it cannot shake off the Feaverish matter, by sweat, it carries it self forth of pores, together with it, any way it can find; wherefore, when there lies a most easie passage, for the boiling Blood, through the vessels opening into apertures of the Nostrils, from that Port (like the same new Wine when the vessel is opened) being enlarged by a spumous refraction, it abundantly leaps forth. The continual Feaver being cured, by this means, an intermitting Quotidian followed, because after a long deflagration of the Blood, and great loss of it, what Blood was remaining, being very much deprived of Spirit, and the Salt, with the left Sulphur being thoroughly roasted, easily contracted that kind of disposition, whereby it was apt, not rightly to concoct the alible juice, but to pervert it into a matter very fermentative.

A Matron, about sixty years of age, when she had sat up a certain night, going to bed in sheets, not thoroughly dry, began to be ill; at first she was troubled with a suffocating Catarrh, that by reason of the serous deluge, falling on the Sarynx, she could hardly breath; neither could she sleep; the next day with a nauseousness, and want of Appetite, with some little excess of thirst and heat: on the third day, an acute pain invaded her in her side, with a Cough, and the Feaver increased: her Urine was red, and clear, with a laudable Hypostasis, an unequal, and an intermitting pulse. A Physician being sent for, she was let Blood to ten ounces, also that day, her belly was copiously loosened by a Clyster: About night the pain vanished, and she slept indifferently: her Urine was then red, troubled, and full of contents: on the fourth day, the Feaver was somewhat increased: In the evening troubled with a Cough very much, and by and by following thereupon the acute pain (as before) in the same side; her Urine being again clear, with an Hypostasis: Her pain, from her being let Blood again ceased; on the fifth day, the Feaver was more remiss, but at night she was unquiet with heat, and a tossing up and down of her body, but without pain. The next morning she sweated plentifully, and was eased; then using still a slender dyet for some days, and being once purged, she grew well without relapsing. It is worth observation, that whilst the pain troubled her, the Urine was clear, and with an Hypostasis, nor troubled by the cold; which however, the same being allayed, became presently thick, more red, and filled with contents.

This Disease, because of the acute pain in the side, as it were a Pathognomic sign, might be called a Plurisie: but we have here a Feaver, preceding the pain, and not the product of it; The evident cause of the sickness was Transpiration being hindered by the constriction of the pores; The Blood growing hot, by reason of the *Effluvia* being retained, and also too much abounding with a serous latex, as it were vomiting very much of it, from the Arteries terminating in the Larynx, caused the sense of the suffocating Catarrh: For this kind of Distemper (as also the Cough with great spitting) arises not, for that the watery humor (as is commonly said) falls from the head, into the throat, and lungs; but because the serous Latex is poured forth, now from the pneumonic vessels, immediately into the lungs, now dropping forth from the Arteries opening into the Larynx, falls down on the breast; on the third day, from the same serous humour, with a portion of the Blood, being fixed in the side, the acute pain arose; for the Blood beginning to grow fervent, when as yet it did contain in it self a crude matter, and (as it should seem) something sour, from the degenerate alible juice, deposed the same, (because it could not cast it forth of doors by sweat) by a proper lustration or purging through the intercostal Arteries, into the Membrane surrounding the Ribs; and there (as it is always wont in a Plurisie) either by coagulation, (which may be lawfully suspected) or by the shutting up of the vessels, the Blood being intangled with the same matter, is stopped in its motion; then being increased in its bulk, by a new coming still of the Blood, it causes a break of the union, and so an acute pain. That in this sick Woman, the same kind of matter, disturbing the mass of Blood, with a portion of it extravasated, was fixed about the Pleura, it from thence hapned, because the pain urging, the Urine was clear, and not full of contents: then when the vessels, by reason of Phlebotomy, being emptied, they supped up again that matter, into its mass, before exterminated from the Blood, the Urine presently became troubled, and again big with contents: The pulse was unequal, and intermitting, because of the idiocrasie or proper disposition, which she was wont to have in every intemperature: for when I cured this Woman of a Feaver, many years before, her pulse being unequal, and intermitting, had struck a fear in me, and others, of a sad presage, concerning the event of the Disease, which however at that time, (as also in this sickness) ceased, prosperously, and without any horrid Symptom.

A strong young man, and corpulent, after immoderate Exercise, about the Summer solstice, and then a sudden cold coming upon the heat, found himself ill: At first, a want of Appetite, nauseousness, and cruel pain of the head, as also thirst, and a more intense heat than usual troubled him; on the second day, an acute pain invaded him on his right side with a Cough, and difficult breathing; Blood being presently taken plentifully from the Arm of the same side, that pain remitted somewhat, which yet in the evening returned, being made more cruel by a Cough, and bloody Spittle. The night followed, without sleep, and very unquiet: on the third day, he was again let blood, besides Liniments and Fomentations were applied to his side; Moreover, Pouders, Juleps, and anti-pleuretick Decoctions, being taken inwardly, about night the pain almost wholly ceased. Then by and by, he was afflicted with a cruel Head-ach, and a Vertigo: on the fourth day, a stream of Blood fell from his right nostril, about two ounces, by which the pain of his Head clearly ceased, and the Vertigo; but in the Evening, the pain in the side before distempered, returned with greater fierceness: In the mean time his Pulse was small, and weak, that when it was consulted upon, for the letting him blood again, 'twas thought dangerous, lest his dejected strength would not admit of such Remedy: wherefore, Phlebotomy was performed only, in a very small quantity, and a Fomentation, and a Cataplasin was prescribed to be diligently applied to his side; besides twenty drops of the Spirit of Harts-horn, to be taken in a

spoonful of Cordial Julep, and the same to be repeated continually, within the space of six hours: He sweat that night very much, and the pain much remitted, his spitting was but little, interspersed with Blood, which, within a day wholly ceased, and the pain also leisurely vanished. The sick man took twice a day, a scruple of the same Spirit of Harts-horn, and within a few days, he grew perfectly well, without relapsing.

This Feaver was a simple Synochus, stirr'd up from the evident cause, viz. a Constriction of the Pores: as soon as the Blood began to be somewhat filled with the adust Recrements, and so to swell up more, the matter, which should have been separated, by reason of its peculiar evil, was tranferred into the Pleura, and being there fixed, compelled the Blood coming to it, to be coagulated, and therefore to be stopped in its circulation, and (when it could not be received by the Veins) presently to be extravasated: from hence hapned the acute pain in the side, and bloody Spittle, by and by, after the beginning of this Disease; then afterwards, the same matter being thrust out of that nest, which it had got, and being supped up again into the mass of Blood, was fixed in the head; and there inducing the like stagnation of the Blood, and (as it is probable) coagulation, caused the Vertigo, and cruel pain; which nevertheless was quickly cured, by the hemorrhage being arisen, by reason of the extravasated Blood. A part of the morbidick matter, being after this manner drawn away, the other part resumed by the Blood, was again conveyed to its usual nest, to wit, the side before distempered; where depositing its Latex, (to wit, a portion of the Blood) it did coagulate it again, and compelled it to be extravasated, or to flow out of the Vessels: For that pain being renewed on the fourth day, with the bloody Spittle, from the ebullition of the Blood, too extreemly, and therefore flowing out of the Vessels, would not be brought away; because at that time, the Pulse was small and weak, with a falling down of the Vessels, that indeed the Blood was thought to have been run all out of the Vessels, for that being coagulated by the morbidick matter, (and therefore tho' expelled the Arteries, yet not being able to be carried back by the Veins) it was stopped in its circulation. Upon this, an acute pain followed, because the Blood being heaped together by its frequent approach, and elevated into a Tumor, made a dissolution of the union; also, by and by from the beginning, a bloody Spittle came upon it, because the Blood being restrained within, in the Body, somewhere in its motion, by reason of the most tender, and easily opening little mouths of the Vessels, ran forth into the Cavities; when to the same outwardly extravasated, by reason of a more thick skin, and the mouths of the little Vessels being locked up, no way lay open, unless by its being made and ripened into an Imposthume. The opening of a Vein profited in the beginning of the Pleurisie, because it restrained the Blood, somewhere hindered in its circuit, from too great effervescency; but especially, for that, when the Vessels were by that means greatly emptied, they did again receive, and render fluent, whatsoever humors were before exterminated, and also the Blood beginning to stagnate in the distempered part. Also, the Remedies helping most, about the beginning of this Disease, were of that sort, which hinder the coagulation of the Blood, or dissolve it in the coagulating; such they are, which abound very much with a volatile, or an alchalisate Salt: to wit, Spirit of Soot, of Blood, Harts-horn, also Spirit and Salt of Urine, the Pouder of the Claws and Eyes of Crabs, of a Boars Tooth, or the Jaw of a Pike, are of known use. Among the Common People, it is a custom to drink an Infusion of Horse-Dung; which Medicine indeed, I have known often to have brought help, in deplorable cases. In the mean time, all acid things whatsoever, because they more coagulate the Blood, and hinder expectoration, are highly hurtful in this Disease.

CHAP. XII.

Of a Malignant or Pestilential Feaver in general.

BESIDES the continual Feaver, which is already described, and which arises from some principle of the Blood being too much carried forth, there is another species of this, which is stirred up, by reason of the Blood being touched with some invenomed Infection, and therefore liable to enter into various coagulations, and corruptions: In which, not only the Spirit and the Sulphur, as in a Putrid Feaver, rage, and compel the Blood to grow immoderately hot, but besides, the mixture of the Blood is presently dissolved, and its liquor goes into parts; and so most horrid Symptoms, with manifest danger of life, are induced in this sort of distemper. Under this rank, we comprehend Malignant, and Pestilential Feavers, the Plague, Small Pox, and Measles: of which we shall speak presently.

Pestilential Diseases, wander so in the dark, and have an unknown original, that their causes, and beings are seldom explicated, without having a recourse to occult qualities. By the unanimous consent of all, the strength, and power of these are placed in an invenomed matter; because we perceive, from a pestilent distemper, strength suddenly to be overthrown, and life quickly destroyed, no otherwise than from the drinking of Poyson. And therefore, for the explicating the nature of the pestilence, it will not be besides the matter, first, to enquire concerning Poyson in general, and by what means it distempers our Bodies, then to shew what sort of Poyson is sprinkled in the Plague, and contagious Diseases: which being performed, we will treat particularly of the Diseases but now recited.

Every thing deserves the name of Poyson, which striking into our Body, after an occult manner vehemently hurts the temper, and actions of any part, or of the whole, profligates the Spirits, or perverts their motions, solves the mixtures of the Liquors, and induces Coagulations and Corruptions, destroys the functions and ferments of the Viscera, and so suddenly and hiddenly brings life into danger. Of these, which after this manner lie in wait for us, there is a mighty plenty, and very rich provision in the nature of things: oftentimes they are inwardly begotten within our body; outwardly they are abundantly supplied from every Coast, and out of every tract of Earth, Water and Air, these daily arise out of the distinct families of Minerals, Vegetables, and Animals, and somingle themselves with our Food, yea, with our Medicine, that we may complain with *Pliny*, *Quod non sit fateri, an rerum natura largius mala, an remedia genuerit*. That it was not known, whether Nature had begot greater Evils, or Remedies.

As there is great varieties of Poysons, so, as to their Subjects; and ways of hurting, there is no less diversity of them: for the most Poysons, in their whole substance are said to be contrary to us, that whatsoever they come to, with a burning force, and like fierce fire, they reduce into ashes, yet out of these, some being noted for a peculiar raising of hurt, do more endamage one one part or substance than another: The Subjects, on which the taint of Poyson, is next and more immediately inflicted, are twofold; to wit, the animal Spirits, or the spirituous subtil Liquor flowing in the Brain, and nervous stock; and the Blood flowing in the Vessels, and Heart, when the object is carried only to one, or being impropportionate, at one to either, that from thence, the disposition of the Liquors, or of the containing parts, is overthrown, whereby the necessary functions, for the performing of life and sense, are restrained, and this done latently, and as it were unforeseen, these kind of Distempers, we ascribe to Poyson.

The nervous Bodies, with the animal Spirit, are not invaded wholly after the same manner, by every sort of Poysons; for they are tormented, now with a Stupor, now with Convulsions, and those of divers kinds and manners: The Bile of a Tarantula, causes dancing: A Power sent from the Torpedo, by the Angle, or lines of the Net, stupifies the hand of the Fisher. The Roots of the Wild Parsnip, or the Seeds of Lolium or Darnel, being eaten, make men mad: Opium, Mandrakes, Henbane, and the like, cause deep, and sometimes deadly sleep. These and many others, chiefly impress their Poyson, on the spirituous or animal faculty, without any great perturbation of the Blood, or hurt brought to the heart.

There are also some Poysons, which most of all insinuate their malignity, to the mass of Blood; therefore, from some Medicines, there have been produced, a yellow or black Jaundice, sometimes a Leprosie, or leprous distempers, and swellings of the whole body, vapours breaking forth from secret hollows of the Earth, also from Coals newly inkindled, often suffocating the vital Spirits, at once congeal the Blood, and stop it in its motion, whereby the flame of life in the heart, could not be continued. How much corruption of the mass of Blood is imparted from the pestilent Infection, is perspicuous to every one, from the Spots and Welks, which are as it were the marks of the blasted Blood.

If the hurt, being first inflicted to either, *viz.* The regiment of the Heart, or Brain, be more lightly made, it is for the most part cured, without any great offence to either; wherefore, Convulsive Motions, Stupefaction, Lethargy, Melancholy, Paralytick Distempers, do not seldom begin with a laudable Pulse, and without an immoderate effervescency of the Blood; and then, if the distemper does not get strength, leisurely end, and cease. There are other Poysons, which often deprave the Blood, and by dissolving its mixture, corrupt it, in the mean time the animal functions remain whole enough. But if the ferment of the Poyson be stronger, and hath more deeply fixed its roots, presently the Poyson is dispersed, from one Province to the other: for when the nervous parts swell up, with a virulent juice, a portion of the Poyson, is carried with the nervous Latex returning through the Lymphatick Vessels, into the Veins, easily into the bosom of the Blood, and infects its mass, with the evil with which it was big: also, from the Blood being grievously impoysoned, the juice, by which the Nerves are watered, quickly contract the infection; hence mad men are in a Feaver, and those taken with a pestilent Feaver, are most often tormented with a Delirium, or Phrensie. Concerning these things, we must consider, what the alteration is, or the impression of hurt, which is inflicted from the Poyson, to the animal Spirit, with the brain and nervous appendix; and what also, to the Blood, with the Heart and the annexed Vessels: tho' here, it is not in the power of humane skill or wit, plainly to shew, or

as it were point out with the finger the manner of its being done ; yet we may be able to attain to some little knowledge of this thing, by reasoning, and by comparing it, with other distempers.

Concerning the former, we shall observe, that the subtil Liquor, or animal Spirits, where-with the Nervous Bodies are blown up, and by whose expansion, sense and motion perform their reciprocal actions, are easily perverted from their tensity, and equal expansion : for as the Nerves are of a soft texture, and the Spirits which abound in them of a very subtil substance, they cannot endure any strong or vehement objects ; wherefore when any violent or impropportionate thing falls on them, they are often compelled from their expansion, and excursion into flight, and a running backward, and not seldom into irregularities of motions : wherefore sudden passions of the mind distract them, and drive them into Spasms, and Convulsions ; when the Alible Juice, by which they are repaired, is supplied too sharp, four or austere, they suffer now Palsies, and now Contractures : If that some object more incongruous, (such as we have affirmed Poyson to be) should be offered, whose Particles are indued with such fierceness, or are of such a kind of configuration, that when they grow impetuously hot with the Nervous Liquor, they shake or lose here and there its more subtil or spirituous part, or wholly drive it away, and fix the remaining Liquor either with a styptic force, or by ebullition, force it into inordinate motions ; hence of necessity, evil distempers of the Brain, and Nervous parts arise, viz. sometimes a Convulsion, Trembling, Shivering, sometimes loosnings, or a stupefaction, and other symptoms of more grievous note. What things after this manner infect the Nervous Juice with Poyson, are now more thick, and only when they are applied in a very Corporeal substance, do inflict their hurt ; now they are thin, and being resolved, even into a vapour or breath, pour forth from a certain little prick, the ferment of Poyson, through the whole Nervous stock. Sometimes the Poyson of some hurtful thing, being eaten, first begins its Tragedy in the Ventricle ; more often by a naked touch, leaves on the superficies of the Body, a virulent taint, which easily and quickly with its ferment, contaminates the Spirits, dispersed through the whole. The Infection, wherever inflicted, either within or without, is more largely dispersed from the extremities of the Nerves, by their easie passage, being from thence brought into consent of the evil, by the very many little shoots of the same branch. Often a more light touch of an invenomed thing, by the finger, or extremity of any other member, presently communicates to the Brain, the received infection, and from thence it is retorted into the whole Body, and the farthest members ; the reason of this is, that both the Particles of the Nervous Juice, and of the same invenomed infection, are so light, and ready for motion, that they pass through most swiftly, as the Rays of light through a Diaphanous medium, the whole mass of one another.

2. As often as the Blood contracts hurt from some Poysonous thing, the Poyson is fixed within ; either slow, and of lesser activity, which does not presently betray it self, nor break forth into cruel symptoms, till of a long time after, it is ripened by a silent fermentation, and hath first infected the whole mass of Blood, as may be observed in some Poysons, which are said to kill at a distance, and not till after some months or years. Or the Poysons inspired into the Blood, are imbued with a much more acute sting, that from their Contagion, the Infection contracted, presently breaks forth into cruel symptoms, and thereupon follows now a Feaverish efferency with Vomiting, Thirst, and burning of the Precordia, now a swelling up of the whole Body, a discoloration of the Skin, oftentimes a breaking forth of Wheals, and Bubbles, and frequently also a sudden loss of all strength, so that sudden death, without tumult, and almost insensibly steals upon one : where by the way it is to be noted, If the Spirits of the Blood, provoked by the enemy, are able to encounter him, and to strive for the victory, this Feaverish ebullition of the Blood is stirred up from the conflict ; but if the Particles of the Poyson, being far stronger, suddenly profligate the Spirits of the Blood, and extinguish life, presently the bloody mass is corrupted, neither can it be circulated in the Vessels, nor rightly inkindled in the heart.

If it be yet demanded, what mutations, the Blood infected with Poyson, undergoes, either in its substance, or consistency, that, for that reason it is rendred unfit for the sustaining of Life ? I answer after this manner ; Some Poysons fuse the Blood, and too much precipitate its serosity, such are Medicines, which by a strong killing Purging, or by a *Profluvium* of Urin, or a discoloration, or swelling up of the whole Body, or with an eruption of Pustules, cause a very great secretion of the ferous Latex ; in the meantime a great ebullition of the mass of Blood is induced, whereby the Vital Spirits are greatly destroyed, the Particles of Salt and Sulphur too much exalted, by the concoction, and are often so roasted, that a Yellow or Black Jaundice is caused.

There are Poysons of another kind, far more dangerous, which congeal the Blood, and by destroying its mixture, corrupt it, viz. the first induce a congelation to the bloody mass, and then a Putrefaction : for when the Spirits of the Blood, being overthrown, by the contagion of the Poyson, are dissipated, the equal mixture of the Liquor is loosned ; wherefore the more thick Particles mutually infold one another, and (like Milk, when Rennet is put to it, or growing sour of it self) are coagulated apart : hence the Blood curdles in the Vessels, that it is

less readily circulated in them: coagulated portions of this, being inwardly diluted, into the bosom of the heart, are apt to stagnate there, and so to bring forth frequent syncopes and swoonings: being carried outwardly, and in the circulating, fixed in the skin, sometimes being more plentifully heaped together, they induce a suffusion of blackness through the whole, sometimes being more sparingly dispersed, they cause only spots, or Purple marks, like black and blue streaks, and other appearances of malignity. But the coagulation of the Blood, quickly disposes it to putrefaction or corruption; as is seen in extravasated Blood, which is wont to grow soon black and putrid. For the Spirit being exhaled, the Particles of Sulphur and Salt remaining in the Blood, begin to go apart one from another, and to break the bond of the mixture, from whence follows Putrefaction.

These things being thus premised of Poyson in general, the reason of the method requires that we enter upon the handling of Feavers, which draw their Original, altogether from a malignant, and invenomed infection: and as under this title, the Pest or Plague easily obtains the chief place, I will begin with its consideration, and afterwards, I will speak of Malignant Feavers, Small Pox, and Measles, in order. But yet, before I shall propose its definition, I will briefly inquire, of the pestiferous Poyson, what its Disposition and Nature may be; also, from whence it may be born; and lastly, by what means it is propagated into others, by contagion.

For the expressing the Nature of the Plague, Authors are wont to chuse some invenomed Bodies, and from their Names, to frame an Elogy of this most wicked Disease; wherefore in the definition of the Pest, are commonly recounted the Nepelline, Aconital, and Arsenical Poyson: the Lethiferous force of which however, as it consists in a very thick matter, and does not exert or put forth it self but by a Corporal contact, doth not truly imitate the essence of the Pestilential Disease: for this is founded in a Spiritual and Vaporous Infection, by which its *Effluvia* being every way diffused, so potently unfold themselves, that out of the best seminary or seed-plot, they quickly propagate a fruitful Crop of Death and Destruction. By reason of its notable activity, this Infection may deserve to be called, as it were a certain quintessence of Poyson; the very agil and subtil Particles of this, do penetrate all Bodies, and inspire them with its ferment: for either being dispersed through the Air, or hid in a certain tender or cherishing nest, tho' they strike against the humane Body but lightly, and as it were through a Casement, they easily subdue it; for both the Animal Spirits, and those of the Blood, they quickly infect, and by that means, shortly pour forth the venomous taint, into all the members.

When a Pestilential Breath or Vapour, hath invaded any one, and that Poyson hath first laid hold on the Animal Spirits, or those of the Blood, or both of them at once, (as hath been already said of Poysons) the taint is quickly derived from the subtil and more thin substance of these, into a more thick matter: because it quickly ferments the whole Mass of Blood, or of the Nervous Juice, and the Excrementitious Humors, every where abounding, and from thence is deduced into the solid parts, and fixes the evil in them. If this Disease, first possesses the Animal Spirits, presently the hurt is communicated to the Brain, and the Nervous stock, and especially to the Ventricle, forthwith it impoysons the humour growing in these; loosens its mixture, perverts the regular motion, and renders it wholly incongruous and infestous to the more tender substance of the containing parts: by and by from thence, Cramps and Convulsive Motions, cruel Vomitings, pains of the Heart, also Phrensies, Deliriums, or pertinacious Watchings, are stirred up, about the first assault of the Disease: when in the meantime, the infection not being yet dispersed through the Blood, the sick are not Feverish, nor are troubled with inordinate Pulse, or Syncope, or appearances of marks; which symptoms however arise afterwards, as soon as the Blood is infected. If when the Spirits of the Blood are first possessed, with the impoysoned infection, either drawn in with the Air, or attracted through the Pores, its ferment is presently dissipated through the whole Mass of the Blood, the infected portions immediately begin to be loosened from their equal mixture, to go into parts, and to be coagulated, and the same, being delated, into the bosom of the Heart, are wont there to stagnate, and so to induce a Syncope, Swoonings, and often sudden Death; also being carried outwardly, fixed about the skin, to cause Buboës, inflamed risings, and other marks of Poyson; in the meantime, the sick appear well in mind, nor are they troubled with Delirium nor Convulsive Motions. If that from a more strong cause, the hurt is inflicted to both parts at once, the course of the Disease is performed with a more horrid provision of symptoms, and especially with a Syncope, and Phrensie at once infesting.

As to what appertains to its rise; when the Plague first arises in any Region or Country, there is attributed a two-fold cause of it, *viz.* Primary or Metaphysical, also Secondary or Natural, subordinate to that: The very Heathens did acknowledge this Disease, wherever it raged, sent first of all from God, for the castigation of the wickednesses of men, and therefore for its extirpation, they equally made use of Prayers and Sacrifices as of Medicines. As to what belongs to the Natural cause, there are divers opinions. Some will, that the Pestilence newly arisen, be derived

derived from the Heavens, and influences of the Stars only: on the contrary, others have affirmed it only to arise from the internal putrefaction of the humors of our Body: but these endeavour to deduce the cause of this sickness too far off, and these more near than it ought. We will walk in the middle way, and what reason persuades, and what very many Authors assert, we will place the chief and first seminary or seed plot of this Poyson, in the Air; because, it seems consonant to Reason, that from the same Fountain, from which the common food of life is had, the beginnings of death, no less diffusive, are to be sought. There is the same necessity for our breathing in the Air, as of Fishes living in the Water; wherefore, as to Waters infected by Poyson, the Murrain of Fishes dying in heaps is ascribed; so Men dying of an Epidemical slaughter, without any manifest cause, nothing could kill, besides the Infection of the commonly inspired Air.

For the Air, which we necessarily draw in for the continuance of Life, consists of an heap of Vapors and Fumes, which are perpetually breathed forth from the Earth; in which the exhalations of Salt and Sulphur, being mingled with the atomical vaporous little Bodies, constitute here as it were a thick cloud: the motions of these are swift and unquiet, they are of a manifold figure, and very much diverse, wherefore some continually meet against others, and according to their various Configurations, they cohere with these, and are mutually combined one with another, and from those they are driven, and fly away: from hence the reasons of the Sympathy and Antipathy of every thing, depend. From the diverse Agitations of these kind of Atoms, near the Superficies of the Earth, this or that Tract of the Air, enters into diverse alterations, by which, Bodies, chiefly the living, are variously affected: because the intestine motion, of the Particles of every Animal, depends very much upon the motion and temper of the Particles of the Air: forasmuch as these perpetually exagitate those, raise up those lying asleep, repair the loss of those flying away, shake the vital flame with their Nitrosity, and supply it with a Nitrous-Sulphureous Food, eventilate its being inkindled by continual turns of access and recess, and carry away the Soot and Fumes. So long as an apt contemperation happens in either, for motion and configuration, living Creatures enjoy perfect health and life; but if the little Bodies swimming in the Air, be of that sort of figure and power, that are plainly adverse to the Spirits implanted in living Creatures, they loose the mixtures of these, from the rest, from whose Elements they are collected, and pervert their motions; hence the dispositions of things are destroyed, life profligated, and, the same being scarce extinct, the Bodies undergo putrefaction; hence the tops of Trees, or of Corn, being struck with a blast, suddenly grow dry or wither; hence, among Cattel, the Murrain often rages, which kills at once whole Flocks; by reason of this kind of cause, the Seeds of the Pestilence first put themselves forth, and attempt the slaughter of humane kind: for as invenomed Bodies in the bowels of the Earth or concreted on its superficies, produce the Arsenical or Aconital mixtures, so these being even resolved into vapour, and heaped together in the Air, create most pernicious Airs, from which Malignant and Pestilential Diseases arise; the infection, which after this manner Contaminates the Air, the most ingenious *Diemerbrochius*, a searcher of this Disease, contends, that is only sent (as the wrath of angry *Apollo*) immediately from the angry right hand of God: but this were to multiply without any pretext of necessity. (I will not say beings but) Miracles, and in every Plague to assert a Creation of new substance; when in the mean time, the virulent product of Minerals and Vegetables, which daily appear, and of as quite adverse Nature to us, as the Plague, clearly testify, that there lives hid in the Bowels of the Earth, plenty of invenomed matter, sufficiently fitted for this business. For the little Bodies, which being rouled about with earthy matter, do constitute the Poysonous mixtures in the bosom of the Earth, the same being resolved into vapours, will be no less hurtful afterwards, and impress a pestiferous blast to the Air, which they wander through: wherefore, by the leave of so Learned a Man, I should say, that it seems not improbable, that the things which first of all affix the seed plot of the Pestilence, to any tract of Air, be the Poysonous *Effluvia* of fierce Salts and Sulphurs, and (by the Divine Will instigating) breathing forth from the bowels of the Earth; which sometimes, being a long time before shut up, are leisurely exhaled out of Dens and Caverns; sometimes by reason of the motion of the Earth, or Earthquake, or a gaping of the Earth, they break forth in heaps; also, of the same kind, are those which ordinarily are breathed forth from the filth of Souldiers in their nasty Camps; or from unburied Carcasses; or from places, beset with standing and stinking Mud: but the little Bodies after this manner exhaled, obtain their wonderful height, properties, and abilities, by a long putrefaction, that therefore they are incongruous, and heterogeneous to all others whatsoever, and so being received into the Air, ferment it (as it were a mass of Liquor) and pervert it from a wholsom and benign, into a most pernicious and wicked Nature.

Some Bodies more easily, others not so readily receive the malignant tincture of the Pestilential Air. Those who by reason of ill feeding are full of evil humors, and who by reason of fullness, have their Bloud stuffed with firable Sulphur, receive the Pestilential Poyson, by the least blast of the invenomed Air, especially if fear or sadness happen, which convey inwardly, and

and lead to the Heart, as it were by a certain attraction, the most light darts of the Contagion. On the contrary, those who have their Viscera clean, and the Mass of Blood well tempered, and are endued with a strong and fearless mind, do not so easily receive this infection, and sometimes exterminate it soon, being received.

Thus much for the beginning and divulgation of the Pestilence, according to its first Fountains, and from thence the stream of the infected Air being deduced; it remains for us to speak concerning its propagation by contagion, forasmuch as it is derived, as it were extraduced from some, and so to others.

We understand by Contagion, that force or action, by which any Distemper residing in one Body, excites its like in another. But as this may happen, either immediately by contact, as when any one lying in the same Bed with another, taken with the Plague; or mediately, and at a distance, as when it happens that the infection is transferred from one house to others remote, or also if the Plague come upon any one, after many days or months, perhaps years, handling a Garment, or Household-stuff, brought from an infected House; therefore that the Nature of the Contagion, and its diverse modes may be plainly made known, we will first weigh what that is, which streams from an infected Body. Secondly, How it bears it self through the Medium of its passage. Thirdly, by what means it begets a Distemper like it self, in another Body.

1. That from every Body, although of a more fixt Nature, *Effluvia* of Atoms constantly fly away, and run forth, which round about constitute as it were a Cloud or Halos, and as it were cloath it, like the down of a Peach, is so much received among the more sound Philosophers, that nothing can be more. But by how much the more any thing consists of active Particles, by so much the more it sends from it self little Bodies of more remarkable virtue and Energy. Hence the *Effluvia* which fall from Ambers, are able to move other Bodies from their place: Emanations proceed from Sulphureous things, which fill the whole Neighbourhood with Odors. And so when the Pestilential Venom, as hath been already said, is from hence any where fixed, and though in the smallest Bulk, is of great efficacy and operation, there is a necessity that some emanations proceed from the Body imbued with it, which refer the Nature or disposition of the same Poyson and Malignity, and diffuse them on every side according to its sphere of activity. But when these little Bodies, which retain the contagion of the Pestilence, as they stream from one Body, are not presently received by another, we shall enquire how they carry themselves, in respect of their passage through the Medium.

Where we shall presently meet with a difference in those, from many others, for that the *Effluvia*, which ordinarily evaporate, do not long retain the Nature or Disposition of the Body, from which they flow, but either vanish into Air, or being impacted to other Bodies, are assimilated to them; but those Particles, which fall from a Pestilential Infection, are not easily supped up by the Air, or any other Body, so as they may be wholly destroyed; but among the various confusions of Atoms, and the dashings of other Bodies, they keep themselves untouched. For this untamed Poyson remains still the same almost, and not to be overcome by others, and though it consists of never so little heap of Atoms, will not presently vanish; but with its Ferment, imbues the next little Bodies, and so acquires new forces, and gains strength by going; from whence it lurks a long while in some Nest, and after a long time, when it assaults a convenient Subject, puts forth it self, and imparting the taint of its Poyson to another, raises up again the Disease of the Pestilence anew, which seemed before to be exploded, and though from the smallest Seminary, sprinkles far and near its deadly poyson.

For the Pest brings forth such most sure signs of its Contagion, that some Authors contend, that for this reason it only continues among Mortals, and doth never spring up anew, but is only conserved from its Nest, and carried from thence, from one Region to another. Histories relate, that the Seeds of this have lain asleep for several years, in some Garment or Bed-cloaths, and that afterwards, they being stirred, it hath appeared, and hath stirred up anew the Disease of the Pestilence, increasing with a mighty slaughter of men. When by reason of the Tinder, or cherishing Nest, the Plague is propagated after this manner, at a distance, the invenomed little Bodies, which remain in the infection, being moved, presently leap out, and unfold its Poyson every way, as it were by a certain irradiation: if that they strike against any human body, presently they lay hold on the Spirits, and are by their Vehicle conveyed inwardly, and then by an easie labour, they infect the Blood and Humors, wheresoever flowing in the Vessels, with their Ferment, and quickly bring to them coagulations and putrefaction. And after this manner, through the most subtil *Effluvia*, is made as it were a certain transmigration of the pestilential Disease, even as when a shoot being cut off from some Tree, and laid up for a time, and afterwards ingrafted to another Trunk, though from the smallest Bud, it is able to produce a Tree of the same kind and nature.

C H A P. XIII.

Of the Plague.

THus far we have discoursed of Poyson in general, also of the Pestilence, its beginning and propagation by Contagion: it now remains, that we explicate the Description of the Plague, its Nature, according to its Accidents and Symptoms, most worthy of note; then some things shall be added which belong to its Cure.

The Plague may be described after this manner; That it is an Epidemical Disease, contagious, highly infectious to human kind; taking its beginning from an envenomed infection, received first by the Air, and then propagated by Contagion; which having hiddenly and largely set upon men, causes extinctions of the Spirits, coagulations of the Blood, Blastings, Mortifications or Deadnesses of the solid parts, and with the appearances of Wheelks, Buboës, or Carbuncles, as also with the horrid Provision of other Symptoms, brings the Sick in danger of Life.

Although the Plague be one kind of Disease, and its specific differences, or essential are not found, yet by reason of the divers kinds of Accidents, which come upon it, some diversities and irregularities of it are observed, which something vary the type of the Disease, though they change not the species. For first this Distemper sometimes is more universal, that it rages every where through many Villages and Cities at once; but sometimes it is circumscribed in narrower bounds, and only threatens one Region or Tract of Land. Secondly, Sometimes the Plague comes simple, and unmixed with other Diseases, wherefore privily, and as it were by surprise, almost without a Fever, or vehemency of Symptoms, brings a secret killing of the Sick. Sometimes it is complicated, with a number of other Diseases, that the business is carried with tumult and frequent skirmishing between Nature and Death. Thirdly, the degree of Malignity constitutes a great difference; for the Plague in some places and times is much more mild, that many of the Sick escape; sometimes it is highly mortal, that most taken are killed, and that scarce one of a hundred recovers.

But because this Disease hides its weapons, and coming on men unawares, kills them suddenly, therefore it shall be our work, that by some signs, as it were Watchmen planted, we may know the clandestine coming of this Enemy, although we are not able to foresee it from afar. Very many signs happen, which foretel shortly a Plague about to come; to wit, if the Year keeps not its Temper, but has immoderate, and very unseasonable excesses, either of Heat or Cold, or Driness or Wet; if the Small Pox or Measles do every where rage; if Boils or Buboës accompany reigning Fevers. Besides, Astrologers are wont, from the Aspects of the Stars, or Appearances of Comets, to predict the approaching Plague, but this ought rather to be called a vain Conjecture, than a certain foreknowledge. From a preceding Famine, a most certain presage may be taken, of a Plague to follow, as in the Adage, *Μετά λιμῆς λοιμὸς*; the Plague comes with the Famine. For the like Constitution of the Year, which for the most part, by reason of the Corn being blasted, brings scarcity, is apt also to produce the Plague; also, an evil way of feeding which people in Dearths use, eating all unwholsom things, without choice, disposes their bodies to the more easie receiving the Infection. Yea, also Earthquakes, fresh openings of Caverns and secret Vaults, by the gaping of the Ground, by reason of the Eruptions of malignant and empoysoned Airs, often give beginning to the Pestilence. For indeed, as there is need of great diligence to foresee, as it were from a Watch-Tower, the approaching Plague, so there is no less need of care and diligence, to consider, or take notice of the same, being fresh risen, and the shooting of its first darts; for oftentimes, being too solicitous, we dread vulgar Fevers, if perchance they end in Death, for this Disease; and sometimes being too secure, contemning the Pestilence, by reason of its Symptoms, like to a common Fever, we apprehend not our danger, till too late; wherefore, for the more full knowledge of this Disease, we will subjoyn its Signs and Symptoms both Common and Pathognomic, or peculiar, and briefly describe their Causes, Means and manner of being done.

Besides the Signs already delivered, which by a certain demonstration *a priori*, or beforehand, bring a suspicion of the Plague about to come, there are others, the concurrence of which, plainly shew its presence in the sick Body; of these, some are common to the Plague, with a Putrid Fever, some are more proper to this Distemper. For the impression of the Pestilence most often stirs up an effervescency of the Blood, and so has frequently a Fever joyned with it, that among some, in the definition of the Plague, it hath the place of a kind of Fever; wherefore, by reason of the ebullition of the Blood, and the hurt brought to the Viscera, presently there follows, a growing hot, a spontaneous weariness, thirst, a burning of the Præcordia, often great vomit-

ings,

ings, pains of the Heart, Torments of the Intestines, a Scurfiness of the Tongue, or a Blackness, a pain of the Head, Watchings, Phrensie, Palpitation of the Heart, Swooning, and sudden loss of Strength; though Feavers are most often beset with these kind of Symptoms, yet if at the same time the Plague hath spread in the Neighbourhood, and a fear of it hath possessed the minds of men, hence a greater suspicion of this Evil is caused, especially, because, whilst the Pestilence reigns, other Diseases in any one, leave their proper Nature, and change into it: wherefore, if there happens to the Distempers but now recited, a Communication of the same Sickness to many, and a frequency of Burials, that it becomes every where very deadly, and spreads largely even by contagion; and if besides, Buboes, Carbuncles, Spots, or other marks of the Pestiferous Infection appear, the business is put without doubt, and we may with no less faith denounce it the Pestilence, than when we see an House flaming, with fire breaking through the Rafters, we cry out Fire. But because here is mention made of Buboes, Carbuncles and of other Symptoms (of which we have already spoken, where we treated of Putrid Feavers) it remains that we briefly touch the Causes of them, and the manner of their being made: They are these; A Carbuncle, a Bubo, Whelks, Inflammations, and malignant Pustles.

Concerning these in common, we say, that they are all produced of the Blood and Nervous Juice, touched with the pestiferous Poyson, and coagulated in parts, in their Circuit, and distempered variously with Putrefaction; forasmuch as the Spirits residing in either Liquor, especially in the Blood, are no sooner profligated, by the blast of this malignant Disease, but a coagulation is induced to the remaining Liquor, even as Milk growing sour, or when some acid Juice is powred to it, wherefore, portions of it being more grievously touched with the Poyson, they soon curdle or grow into gobbets, and suffer corruption with blackness, like Blood out of the Vessels; from whence, presently they hinder the motion of the rest of the Blood in the Vessels, and in the Heart, and by means of its Ferment, more coagulate it; but whatsoever by congelation grows into curdled gobbets, unless it be presently cast out of doors, causes Death quickly, by restraining the Circulation of the Blood; and being thrust forth outwardly, towards the superficies of the Body, it is stopped in its motion, between the narrow Windings of the Vessels; and being wholly destitute either of Spirit, or being struck by a blasting, produces its Deadness, black and blew Spots, and black or purple Marks; or by reason of the Salt and Sulphur being exalted by the Pestilential Ferment, and affecting new things, grow together into tumors of a various kind.

A Carbuncle, or fiery Inflammation, is a fiery Tumor, with most sharp and burning Pustules round about it, and infesting the sick with an acute pain; which arising in various places severally, will not be ripened, but creeping more abroad on the superficies, burns the skin, and at length shakes off the Lobes or Gobbets of its Corruption, and leaves an hollow Ulcer, as if burnt by an Escharotick or burning Plaster.

The Generation of Plague-Sores, seem to be made after this manner, when poysonous Infections do strike into the Blood, in its own nature torrid, portions of it congealed, are fixed in the superficies of the Body; and in that place, because the motion of the Blood is a little hindered, a Tumor at first small, is induced; which afterwards, by a malignant Ferment, unfolding it self more largely, being leisurely increased, creeps into the neighbouring part: A Suppuration follows not, because the matter being extravasated, and stagnating, is not concocted and digested by a gentle heat, but by reason of the Particles of the outrageous Sulphur, together with the carried forth Salt, being heaped up in these Tumors, and because of the stagnation, they being presently loosened from the mixture, a burning is excited, as if a Caustery were affixed to the part: pieces and lobes of skins, eaten as it were from a covered Eschar, fall off, because the corrosive Venom, impacted in the Muscles, gnaws not only to the superficies, but those that lie transverse through the whole substance; wherefore, before all the flesh is consumed with the Membranes, in which the eaten Pieces were involved, some piece, as it were cut off from the rest, falls away. A Carbuncle, oftentimes but one, oftentimes more arise: sometimes they are alone, sometimes they are accompanied with a Bubo.

A pestilent Bubo springs forth only in glandulous places, into whose substance goes, not only the Blood congealed by the Poyson, and carried through the Arteries, but the nervous Juice heaped up there, and carried back into the Veins. Because this Tumor happens from less torrid Juices, and in part more frigid, therefore it partakes of suppuration: for the matter being leisurely heaped together, when (by reason of the stagnation) the vital Spirit being departed) it had lost the form of Blood, it was by a long concoction converted into matter, from the particles of Salt and Sulphur exalted, and restrained in the Tumor. But that these Tumors only happen in the Glandula's, the reason is, not that by the destination of Nature, the Nest or Tinder of the Disease is carried to these parts, but as the particles of the virulent infection, abound every where in the Blood, and nervous Juice, they are more readily gathered together, as in a common Family, and where the Blood being dilated to the extrem parts of the Arteries, and is so not readily received, and carried back by the Veins, and also the alible Juice to be carried back from the Nerves, into the Veins, is depozed; either of these, as it appears clearly, by late observations of

Anatomists, and by experience, are made or done about the Glandula's; wherefore, when in these parts, either humors, being stuffed with the pestilent seeds of the Contagion, come together at once, as it were the Nest of the malignity, because of the virulency here deposited from either, is blown up.

Wheals, fiery Inflammations, and purple Spots, in respect of the Venom, are of the same stuff as the Tumors but now described: but in these, the product of the virulency consists in a lesser substance, yet with greater danger, by reason of the seeds of the Poyson being more dispersed; more small portions of the coagulated Blood being fixed in the skin, constitute these lesser appearances, wherefore, out of these, some being increased, are ripened into little itching blisters; others, by reason of a certain blasting, or deadness of the corrupted Blood, grow into black and blew, and purple spots.

Although the Plague, by reason of its sudden, secret, and very swift assault upon sick people, hardly giveth time or place for a Prognostick, and when this Disease, by reason of the occult manner of hurting, contains in it self nothing that is not suspected, yet there are some signs that appear in its course, by which we are wont to foretel either Life or Death. The business is then desperate, if the Disease pass presently into an Epidemical Distemper, and makes violent Assaults; if that bleeding, or only a small Sweat follows in the beginning of the Disease, if the Urine be thick and troubled, the Pulse unequal and weak; if a Convulsion, or a Phrensie presently follow: if the Vomits or Stools are blewish, black, or highly stinking; if the Wheals at first contract a redness, afterwards a blewness; if the Carbuncles are many; if the Buboës at first swelling up, disappear; if strength be suddenly lost, the Face horrid, or grows black and blew; if with a shivering of the outward parts, there be a heat of the Bowels; especially if these, or many of them happen in a Body full of ill humors, or in an unwholsom season. On the contrary, the sick may be bid to be of good cheer, if the condition of the Pestilence be lighter, and less deadly; if the Disease happens in a robust and healthful body, with a strong mind; if Remedies may be timely had, before the Disease hath possessed the whole mass of Blood. Also, if with a continuance of strength, high and equal Pulse, a suppuration of the Buboës, and a large profusion of Matter, with the absence of more horrid Symptoms, the course of the Disease is performed: In the mean time, although here we may hope all good, yet we are not to be secure, because, sometimes the snares of life are laid privily, with the laudable appearance of signs, and we suffer most grievously as from a reconciled Enemy, whose fierce threatnings we seemed to have shunned.

Concerning the curing of very many sicknesses, the business is chiefly committed to Nature, to whose necessity, Physick is the Midwife; and the Office and Science of a Physician chiefly is busied in these, that occasions of giving convenient Aids to this labouring be attended; but the Plague hath this peculiar, that its Cure is not at all to be left to Nature, but that it is to be endeavoured any way, by Remedies gathered from Art. Nor are we to be solicitous of a more opportune, or as it were a gentler time, but Medicines are most quickly to be prepared, and we must not stay for them some hours, no nor minutes: But because, whilst the Pestilence reigns, there is no less need of care, that the Contagion may be driven far away, than that the Disease being impressed, may be cured; therefore a double task is incumbent on the Physician, to wit, that he looks to the prevention of this malignant Disease, as well as to the Cure. To prescribe a method for both these, had been a work of too much tediousness, and to have given you a Dish a thousand times dressed by Authors; wherefore, we will only touch lightly here some chief Indications, and haste to other things.

Preventive Cautions either respect the Republick, and belong to the Magistrate, or private persons, to whom it should be taught, what is to be done by all men, when the Plague is feared.

The publick Care in the time of the Plague, consists chiefly in these, That Divine Worship be truly observed, that all Nests of Putrefaction be cut off, that Filths, Dunghils, and all stinking things may be removed out of the Streets, and all occasion of the Contagion diligently avoided, and that an wholsom means of Living be constantly observed by the Citizens: For which end, the use of Fruits, and of other unwholsom things should be interdicted; that poor people, who have not plenty or choice of food, should be provided for at the publick Charge: If still the Pestilence begins to spread, the empoysoned force of the Air should be corrected as much as may be, which may be best done, by the frequent burning of Sulphureous things; the infected should be separated from the sound, and the dead Carcasses and Household-stuff should be avoided; and lastly, that able and fit Physitians, and Ministers be provided for the use of the sound, and necessities of the sick.

The preventive means of a private person, is wont to be concluded in these three things; viz. Diet, Physick, and Chirurgery. Diet respects the six non-natural things, among which, of the greatest moment are, the Air, and Passions of the mind; as to the rest, Hippocrates his Precept may suffice, viz. Labour, Meat, Drink, Sleep, Venus should be taken moderately. The Pestilent Air should be avoided, by going into some other place; or corrected by the well burning

ing of Sulphureous things, or whilst we breath it should be cured by fumigations and sweet smells, often carried near the nostrils. As to the passions of the mind, fear and sadness, whilst the Pestilence rageth, are as it were another Plague; for in these, the seeds of the envenomed Contagion, which are placed in the superficies of the Body, as it were on the edge of a Whirlpool, are snatched inwardly, by a certain force, and carried to the Heart; wherefore 'tis a most excellent Antidote, to be of a cheerful and confident Mind. I have known many, who (as *Hellmont* was wont to say) by fortifying the Archeus, with Wine and Confidence, never used any other Poison-resisting Medecines, and remained without any hurt of the Contagion among the infected; and on the contrary, some struck with fear, when they have dwelt far from all Contagion, have drank in the seeds of the Pestilence, as if they were derived from the Stars.

Among the Chirurgical things to be administred for preservation sake, are wont to be commended, the opening of a Vein, Cauteries and Amulets. Where there is a fulness with a great swelling up of the Blood; or in those who constantly, by long custom are wont to be let Blood, it is convenient to open a Vein; for the less the Blood grows hot, and is circulated without tumult in the Vessels, it will be so much the longer ere it be contaminated by the pestiferous Disease. Issues made by Cauteries, are so much used, almost by the suffrage of all, for preservation sake against the Plague, that it is become the most common Receipt; for these by a common transmission poure forth the assiduous coming of the superfluous and excrementitious matter; and if that the infections of the Pestilence be admitted inwardly, they are cast forth of doors at these open ports.

Amulets hung about the Neck, or born on the Wrists, are believed to have a wonderful force against the Pestilence; of these, among some of the greatest esteem, are such as are made out of Arsnick, Quicksilver, the Powder of Toads, and other Poysons. That the same in this case may be profitable, besides the Observations of Physicians, this reason may seem to persuade something. The *Effluvia*, or Atomical little Bodies, emerging now from these Bodies, now residing upon these, are before affirmed to fly about through the whole Region of the Air; these, as they are diversly figured, some of them easily cohere with others, but if they strike against some of another form, they oppose and overturn them: hence the particles of the pestilent infection, which are adverse to our spirits, excellently agree with those little Bodies of Poyson, placed near, and are readily fixed to them; wherefore the Amulets made of Poyson, do this. *viz.* They receive the seeds of the Pestilence meeting us, into themselves, by reason of the likeness of parts; also, by alluring the same from our bodies, into their embraces, they in some measure, free the infected from the infection.

The Medicinal prevention hath a twofold scope: First, That the assiduous coming of the excrementitious matter or humors be taken away by a gentle purging as often as there is need: Secondly, That by the daily taking the Poyson-resisting Medecines, our Spirits and Body may be fortified against the Assault of the poyson; By the former, the Food and Cherishers, of which encrease putrefaction brought in by the poyson are drawn away; by the latter, the first enkindling of the pestiferous infection, as it were, a deadly fire is inhibited. Alexipharmies or Medicines contrary to poysons, seem to be helpful against the contagion of the Plague, for this twofold Reason; both because the Mass of Blood and Viscera being filled with the particles of these, and also the Spirits before possessed with the same, they do not easily admit of the company of the impoysoned infection; also, because the Blood being incited by the gentle fury of these, is kept from coagulation.

Thus much for preservation, it follows now, that we speak of the Cure of the Plague. The Doctrine of which, is either general, and comprehends Remedies, which for this end, are taken from Diet, Chirurgery, and Medecine; or special, which delivers the use and Cautions to be exhibited about those Remedies; and by what means we are to oppose the Symptoms variously arising.

Diet comprehends the use of the six Non-naturals, but the chief care, and medical Cautions, are to be given about Eating; the primary Indications of this, consist not at one and the same time together, but ought to be supplied by turns, according to the nature of the thing, and the exigency of Nature. In respect of the malignity, and of the loss of strength, Aliments are to be desired, which greatly cherish the Spirits, and bring a more plentiful Nourishment: in respect of the Feaverish Distemper, a more slender refrigerating Diet, and temperating the Blood, seems to be required: the Physician must regard either, but he may rather intend his Remedies against the Malignity, than the Feaver.

The Helps that belong to Chirurgery, are the opening a Vein, which seldom and very cautiously ought to be used in this Disease, because the Blood being too much exhausted, and the Vessels falling down, Sweat is not so easily procured; instead of this, it is better to use Cupping, with Scarification; for this and Blistring are rightly applied for the drawing forth of the Venom; moreover, against Buboës, Inflammations, or malignant Ulcers produced by them, Cataplasms, Fomentations, Plaisters, Oyntments, and many other things, to be outwardly applied, are to be sought for from Chirurgery, in which some Poysons, as the Electric of Poyson, are

are prescribed by some to be admixed; wherefore, Preparations of Arsnick, to wit, the Oyl and Balsom of it, are commended by many, in this case too of most excellent Use and Efficacy.

Medecines for the Cure of the Plague, are either Evacuators, or Poyson-resisters: The intention of the former is, that the serous Latex in the Blood, and the excrementitious Humors, which abound in the Viscera, be thrust forth of doors; and together with them, very many Particles of the envenomed Infection, every where dispersed in the Body: But these are both Vomitories and Purgers, the use of which is more rare, and only in the beginning of the Disease, also Diaphoreticks or sweating Medecines, which at sometimes may be suffered according as there is strength, are to be prescribed in the Plague; for these more fully, and from the whole Body at once evacuate, yea, and by agitating the Blood, defend it from Congelation, and as they move from the Center, still to the Circumference, they drive the empoysoned Ferment, also the Corruptions of the Blood and Humors, far from the Heart, and so chase the Enemy without the Camp. But Vomits and Purges evacuate less universally, and by concentrating the malignant matter, oftentimes carry it inwardly, and fix it to the Bowels. But these Medecines, whether they operate by purging, or sweating, ought to be of that kind, which have particles, rather agreeable to the empoysoned infection, than to our Blood or Spirits; for such a Medicine will pass through the various windings of our body, with its whole forces and unmixt, and by reason of the similitude of either, more certainly takes hold of the virulent Matter of the Disease, and carries it forth of doors with it self, by the mutual adhesion of the parts, which way provoked Nature leads. Wherefore, Medecines, whether Catharticks, or Sudorificks, are commended before others, which are prepared out of Mercury, Antimony, Gold, Sulphur, Vitriol, Arsenick, and the like; which, when they cannot be subjugated by our heat, or mastered, become the best Remedies against the poyson of a Pestilent Disease; for these do not only potently evacuate superfluous things, but whenas they put forth very strong and untameable particles, and explicate them every where in the Body, dissipate the Ferments of the Poyson growing here and there, and hinder them from maturation; and as these Remedies, being of themselves not to be overcome by Nature, are necessitated to be carried outwardly through the open passages of the Body, they carry forth of doors with them, whatsoever extraneous or hostile thing is met with.

As to Poyson-resisting Medecines, or Alexiterians, which are said to resist the Poyson of this Disease, without any sensible evacuation, they are (for the most part) such whose particles are not very much of kin to Nature, so as to go into Aliment; nor so diverse, as to provoke to an excretion. The same being inwardly taken, and broken into the smallest pieces, inspire the Blood, and Juices flowing together in the Vessels, and Viscera, with their little Bodies, as with a new Ferment, and by moving the same gently, and by keeping them in an equal mixture, defend them from Coagulation and Putrefaction; dissipate the particles begun to be heaped up, one from another, by the same gentle agitation, and hinder them from maturity; and lastly, by prepossessing the Blood and Spirits, defend them from the impressions of the pestilent Mark. Among these, some more simple Remedies are commended, as Rue, Scordium, &c. But most of all by far are esteemed, those that are compounded; wherefore, Treacle, Mithridate, and Diascordium, some of which are composed of no less than fifty simples; that it is esteemed a Crime in Medecines so compleat in all numbers, to omit one Plant, or one Dram of them in their Compositions; the reason perchance is, because very many things being put together, may make a Mass, whose diverse kinds of particles being exalted, by long digestion, may stir up the greater Fermentation in our Blood and Humors.

Having after this manner ranked the Remedies, in which we ought to be instructed, for the curing of the Plague; now next we should speak of the Method of Cure, viz. What first, and then what next should be done in order: but that Disease hath so precipitous a course, that there is neither place for deliberation, nor is there frequently any Physician to be gotten, for fear of the Contagion; wherefore, there is no need here of many prescripts, or a long series of Indications; this business is to be quickly performed, and may be comprehended in a few things. Therefore, when the Pestilence reigning, any one is distempered with the Contagion of this Disease, the help of the Omnipotent God being requested by Prayers, presently Remedies are to be shewn to. If the Plague happens in a Body not thoroughly purged, and prone to Vomiting, presently let a Vomit be taken, whose operation being finished, immediately let a Sweat be provoked, by taking Diaphoreticks, and the same continued as strength can bear it, and afterwards be often repeated. Besides, let Alexipharmicks or Poyson-resisters be used almost every moment, until by the eruption of Whelks, Inflammations, or Buboës, all the Venom be wholly driven forth of doors; but in the mean time, proper and respective Remedies are to be opposed to the most urging Symptoms; but especially fit helps are to be sought from Chirurgery, for the Cure of the Buboës, and Plague-Sores: the whole weight of this business leans on these two Intentions, that the pestiferous Poyson may be every way expelled from within, and then, that the Recourse of what is driven forth, be with equal diligence prevented.

Concerning the Plague, we cannot so readily write Examples, and Histories of sick persons, with exact Diaries of the Symptoms; because these kind of Sickneses came not every year, neither when they spread, is it lawful for every Physician that takes care of his own health, frequently to visit the sick, or to stay long with them, whereby he may denote all Accidents, and diligently consider the reasons of them; which Task however, the renowned *Diemerbrochius* did so firmly persist in, that after him, others may lawfully be superseded from this Work: when some times past, in this City, viz. 1645. the Plague (though not great) had spread, Dr. *Henry Sayer*, a very Learned Physician, and happy in his Practice, many others refusing this Province, boldly visited all the sick, poor, as well as rich, daily administred to them Physick, and handled with his own hands, their Buboes, and virulent Ulcers, and so cured very many sick, by his sedulous, though dangerous Labour. That he might fortifie himself against the Contagion, before he went into the infected Houses, he was wont only to drink a large draught of Sack, and then his perambulation about the Borders of Death, and the very Jaws of the Grave being finished, to repeat the same Antidote: After he had in this City, as if inviolable as to the Plague, a long while taken care of the Affairs of the Sick without any hurt, he was sent for to *Wallingford-Castle*, where this Disease cruelly raged, as another *Æsculapius*, by the Governour of the Place: But there being so bold, as to lie in the same Bed, with a certain Captain (his intimate Companion) who was taken with the Plague, he quickly received the Contagion of the same Disease; nor were the Arts then profitable to the Master, which had been helpful to so many others, but there with great sorrow of the Inhabitants, nor without great loss to the Medical Science, he died of that Disease. As to others, distempered by the Pestilence, he was wont to order this kind of method of healing, if he was sent for before the Buboes or Wheelks appeared outwardly, for the most part he gave a Vomit, the prescriptions of which were the Infusion of *Crocus Metallorum*, sometimes with white, and sometimes with *Roman Vitriol*: The Vomiting being ended, he commanded them presently to be put into a Sweat by the taking of Diaphoreticks; and thence, some intervals being granted, for the recovery of strength, the sweating to be continued to the declination of the Disease: but if he were sent for to the sick, after the appearances of the Marks, the Vomiting being let alone, he insisted only upon Sudorificks.

CHAP. XIV.

Of Pestilential and Malignant Feavers in Specie, and of others Epidemical.

After having having unfolded the Nature of the Plague, by the order of our Tract, we ought to proceed to the Diseases which seem to be nearest like its Nature; which chiefly are Feavers, called Pestilent and Malignant; for it is commonly noted, that Feavers sometimes reign popularly, which for the vehemency of Symptoms, the great slaughter of the Sick, and the great force of Contagion, scarce give place to the Pestilence; which however, because they imitate the Type of putrid Feavers, and do not so certainly kill the sick, as the Plague, or so certainly infect others, they deserve the name not of the Plague, but by a more minute appellation of a Pestilential Feaver: Besides these, there are Feavers of another kind, the perniciousness and contagion of which appear more remiss, yet because they are infectious, beyond the force of putrid Feavers, and seem to contain in themselves in a manner, the *τὸ Θεῖον* or Hand of God of *Hippocrates*, are yet by a more soft Appellation, called Malignant Feavers.

Those Feavers differ both from the Pest, and from one another according to the degree, and vehemency of Contagion and deadliness; as the Plague is a Disease highly contagious, and deadly to humane kind; 'tis the Pestilent Feaver, which commonly spreads with a lesser diffusion of its infection, and frequency of Burials. When the infection is only suspected, and the Crisis happens beyond the Event of vulgar Feavers, only not to be trusted, or less safe, it is esteemed for a Malignant Feaver, They are yet more fully described thus;

When the Feaver commonly spreads abroad; which for the variety of Symptoms, puts on the likeness of the putrid Feaver so called, to wit, when there are present, Thirst, Burning, Weariness, Anxiety, roughness of the Tongue, Watchings, Phrensie, Vomiting, want of Appetite, Syncopy, Swooning, Heart-pains, and a concourse of other most terrible Accidents; if there happen besides, Spots either like to the little Flea-bites, or broad ones, like black and blew strokes, and livid, we esteem this Disease of an evil Nature. If besides these, it is not cured after

after the wonted manner of Feavers, but that the strength of the Sick is cast down, without any manifest cause, and that Death comes often unlooked for, and unsuspected, against the Prognostick of the Physician, there is yet a greater cause of suspicion of malignity. But if it kills very many of the sick, and that those who converse with the sick, contract the evil of the same Disease, that the same Disease spreads through all the Villages or Cities, it may be said to be more than malignant, a pestilential Feaver; which is yet fully proved, if it rages in very many ordinarily with a certain common symptom, as when a Squinancy, Dysentery or deadly Sweat, such as in times past spread in *England*, accompany these sort of Feavers.

If that a Feaver arises, which distempers many living in the same Region together, almost after the same manner, which notwithstanding observes the Laws of a common putrid Feaver in its course, and is cured almost after the same manner, this is not said to be Pestilent, but only a Malignant Feaver; unless that in some labouring with a remarkable Cacochemistry, or fulness of ill humors, the appearances of Buboës, or of spots, sometimes with a deadly Crisis, and a Contagion creeping upon others, betray some signs of Malignity.

If it be demanded, to which Class of the aforesaid Feavers these sort of Pestilential and Malignant Feavers ought to be placed, we ascribe them only to the rank of continual Feavers; we discharge or acquit intermitting Feavers, because by intervals they grant such firm Truces to Nature, and then they regularly and exactly observe their periods, which does not consist with an envenomed disposition. Also we except Hectic Feavers from malignity, because otherwise their mortality would not be so long delayed, but that partaking of poison, they would kill sooner: among continual Feavers, although we affirm, that the simple synochal Feavers are not free, yet they are rarely touched with this evil; but most of all, the Feaver which shews the notes of Pestilence or Malignity, is of that sort, which resembles the figure of the putrid Feaver so called: for when in these Feavers, besides the appearances of virulency, we perceive a continual growing hot of the Blood, which passes through the courses or stadia of beginning, increase, standing and declination, as in putrid Feavers, we deservedly affirm here, the sulphureous part of the Blood to be heated and enkindled, and by its burning to have brought in the Feaver; wherefore in these kind of Feavers two things are especially to be noted, the growing hot of the Blood, and the malignity joyned with it, of which now this, now that is the greater: also, in both there is a great latitude, and very many degrees of its intensification or heat, according to which the Feaver becomes more or less acute or malignant.

The growing hot of the Blood is performed after the same manner, as is already said concerning Putrid Feavers, to wit, the sulphureous part of the Blood growing hot above measure, as it were takes fire by its fervor; in the time of its burning, it accumulates a great quantity of adust matter, upon whose subtraction and seclusion, depend the State and Crisis after the wonted manner of Feavers; but besides these, the Blood being infected with a certain venomous taint, in the burning it begins by reason of the malignant ferment, to be coagulated into parts, and to putrify: wherefore besides the usual Symptoms of the common Feaver, by reason of some congealed portions of the Blood, follow either deadly Distempers, Swooning, a Dejection of the Spirits, also appearances of Spots and Marks; besides venomous *Effluvia*, which depart from the sick, that are able to raise up the like Distemper in others, by the force of their Contagion; wherefore by reason of its perniciousness and contagion, and their various degrees, it is called either a Pestilent or Malignant Feaver.

Also whilst the Blood growing hot, is infected with a venomous and malignant ferment, not only proper coagulations of its mass, with a disposition to putrefaction, are induced; but also the Nervous Liquor, easily contracts the taint of this, from whence it being made impropportionate to the Brain and Regiment of the Animal Spirits, stirs up great irregularities in them: wherefore upon these sort of Feavers, come not only spots and wheals, but most often a Delirium, Phrensie, Sleepiness, Tremblings of the Limbs, Cramps, and Convulsive Motions; I have often observed, that in some certain years, Malignant Feavers have increased, which have shewn their virulency, without the appearances of Marks, chiefly about the Nervous stock; because in some, presently after the beginning, has followed a sleepiness, with a mighty heaviness of the Head, in others, strong Watchings, a perturbation of Mind, with Trembling and Convulsive Motions, but in most, either none, or only an uncertain Crisis, and instead of it, a translation of the Feaverish Matter to the Brain; besides it is observed, that these Feavers creep upon others Contagion, and that very many are killed by them, that therefore they do deserve to be called Malignant.

But these kind of Feavers are sometimes first begun from a venomous infection, and the Blood being touched with the Particles of the Venom, conceives of it self an Effervescency, and is enkindled; as when from a Contagion or Malignant Air being inspired, any one hath fallen into a Malignant Feaver; without any evident cause or predisposition: But sometimes the Feaverish Distemper is induced from a proper Cause, and then the Seeds of the Malignity, either lying hid within the Body, exert themselves in the effervent Blood, or they come from another place by the contaminated Air, as it were the Food of the Flame before enkindled; for it appears by frequent

frequent observation in the time in which an Epidemical Feaver spreads, that others being any way arisen, turn into it.

Malignant Feavers, as also Pestilential, for the most part are popular, and invade many at once; but sometimes they are private, and not ordinary, so that perhaps only one or two are taken in the whole Region; in such a case it is to be suspected that they come not from a malignant Air, or Epidemical cause, but from a morbus provision of the Body; for I have often observed that when in the Spring or Autumn, a Feaver sufficiently common, hath spread in some City or Town, of which very many have died, perhaps some one on whom an evil predisposition and a more strong evident cause, hath brought the Feaver, hath lain by it, with more horrid Symptoms, and great notes of malignity: in which case that malignity is not to be called common to the Feaver, but not ordinary and accidental only.

Although the greatest reason of the difference, by which these kind of Feavers are distinguished from one another, and from other Feavers, consists in their deadliness and contagion; yet sometimes they are noted with a certain peculiar Symptom, from which they take for that time, both the note of malignity, and the appellation of the name: hence in some years an Epidemical Feaver reigns, which induces to most of the Sick a Squinancy, another time an Inflammation of the Lungs, a Pleurisie, Dysentery, or some other Distemper, and that oftentimes most dangerous, and contagious; so the seeds of Diseases, not only derived from the Parents by tradition, excite their fruits as it were by a certain designation, in the same part or member; but also those received from an infection commonly spreading, produce in all, a distemper of the same mode and figure; which yet I think to happen, not because the seeds of the venomous Infection, respect either this or that Region of the Body, with a certain peculiar Virtue; but these so affect the Mass of Blood, by a like manner in all, that there is a necessity, for the sake of washing away this stain, that a Crisis be attempted after the same manner in all. For when, without malignity, the Blood, by coagulation, or perhaps other Causes, is apt to be extravasated, the usual places, in which portions of the same being extravasated, are wont to be fixed, are the Throat, Pleura, Lungs, and Intestines; wherefore, 'tis no wonder, when from a malignant cause, the congelation of the Blood, and for that reason an extravasation is induced, if the Disease is nested in the accustomed cherishing place of Nature.

Concerning the Causes of these kind of Feavers, there is not much business; they are for the most part deduced, in respect of the malignity, from the vicious constitution of the Air; in respect of the Feaverish heat, from the morbus provision of the Body; either of these are easily made clear, by what hath been already said concerning a putrid Feaver, and the Causes of the Pestilence: If the malignity be stronger than the Feaver, and hath induced it, the impression of it is to be imputed to the inspired Air, or to a contagion received from others, if the Feaver be first, its inkindling is ascribed to transpiration being hindered, to a Surfeit, or to some other of the evident Causes above enumerated.

As to the Signs, besides Contagion and Destruction, these shew the malignity of the Feaver, a sudden loss of strength, a weak and unequal Pulse, and evil affection of the Brain and Nervous parts, being suddenly induced, cruel Vomitings, Blackness of the Tongue, a suffusion of Darkness through the whole Body, but chiefly the appearance of Spots, Buboës, and of other Marks.

For the Cure of Feavers, both Pestilential and Malignant, there is greater need of Judgment and Circumspection, than in any others whatsoever: For when there are two primary Indications, to wit, the Malignity, and the Feaverish Intemperance, and when one can scarcely provide for the one, without detriment to the other, it is not easily to be discerned, which should first be helped, or soonest regarded. In respect of the Feaver, Purging, opening a Vein, and cooling things do chiefly help; but whilst these are performed, the Malignity, for the most part is increased, and being neglected, spreads abroad more largely its Poison; against the Malignity, Poyson-resisting Cordials, and Diaphoreticks are required, but these extremely heighten the Feaver, they more shake the Blood and Spirits before inkindled, as it were with the blast of Bellows, and force all as it were into a Flame; wherefore, here is great need of Skill, that these things be rightly ordered in themselves, and where there is most of danger appearing, thence the curative intentions are to be more immediately designed; but so, as whilst one is consulted about, the other be not neglected. But in these Cases, besides the private Judgment of every Physician, experience may supply the chief means of healing; for when as these Feavers first spread, every one almost tries several Remedies, and by the success of them collated together, it may be easily reckoned, what kind of Method is to be relied on, till at last, by a frequent trial, or the footsteps of those passing before, there is made as it were a high and broad Road, for the curing of these sorts of Distempers, bounded both with various observations and warnings.

Besides these sort of Feavers, which spread on many at once, and by reason of the Contagion, Deadliness, and conspicuous Notes of Virulency, deserve to be called Pestilent or Malignant; there are some others, Epidemical or Popular, which almost every Year, either in the Spring or Autumn rage in some Countries; of which the Inhabitants for the most part of them are wont to be sick, and not few, especially of the Elder, to die: In which notwithstanding, no signs of Pestilence or Malignity appear, neither does the Disease seem to spread, from one and so to another, so much by contagion, as to lay hold on many, by reason of a predisposition, impressed almost on all. But these kind of Distempers depend chiefly upon the foregoing constitution of the Year: for if the season going before was very intemperate, by reason of excess of cold or heat, of driness or humidity, and so had continued for a long time, it changes our Blood very much from its due temperature, whereby it is apt afterwards to conceive Feaverish Effervescencies; and from hence a Feaver, now of this Type or Figure, now of that is produced; which presently becomes Epidemical, because it draws its beginning from a common cause, wherewith the bodies of all are in a manner affected: But such Feavers, so far as they depend upon the Blood having gotten a disposition, now sharp, now austere, or of some other kind, by reason of the temper of the Year, for the most part are of the rank of intermitting Feavers; yet by a proper provision of Symptoms, they are wont to be noted according to the peculiar constitution of every Year. These are not able to be comprehended under a certain common Rule, or formal Reason, which may quadrat to the Nature of each of these; because they vary every year according to their several Accidents. However, we will give you the descriptions of these kind of Feavers, spreading of late years in this Region, had at that time, for some specimen of the rest, and add it for a conclusion at the end of this Tract.

There yet remains to be ascribed to the rank of Malignant Feavers, some other private Feavers, and participating of no contagion; of which sort chiefly are those which are wont to happen to Child-bearing Women, by reason of difficult and hard Labour, or by reason of the stoppage of their Courses. Indeed it sufficiently appears by common observation, that these are very dangerous, and often mortal: for if by the parts of the Womb being hurt, or by Cold being admitted, or perhaps by any other cause, the Courses are stopped, and the Humor which ought to be thrust forth, shall be confused with the Mass of Blood, it most wickedly infects it, as it were with a certain venomous mixture; that by that means, presently a Feaver is excited, which with an evil provision of Symptoms, is very much beset, *viz.* with heat and cruel Thirst, Vomiting, pain of the Heart, and Watchings, and for the most part obtains, either no Crisis, or a very difficult one; because, unless the wonted way of the flux of the Courses, may be at length restored, it is wont, after the heat of the Blood hath been continued for some days, to communicate the evil to the Brain and Nervous Stock; from whence, by and by, a Delirium, Phrensie, Convulsions, and other most wicked Distempers, are most often induced, which do not seldom end in Death: but these sort of Feavers deserve a peculiar consideration, which we have more fully determined to shew hereafter in a particular Discourse concerning this business; in the mean time, we will undertake to propose some Instances or Examples of the Feavers, but now delivered, *viz.* of the Pestilent, and Malignant.

The Pestilent Feaver, of late years, hath more rarely spread in these Regions, than the Plague it self: of the only one of this kind, which fell under our observation, I will give you a brief Description. In the Year 1643. when in the coming on of the Spring, the Earl of *Essex* besieged *Reading*, being held for the King, in both Armies there began a Disease to arise very Epidemical; however, they persisting in that work, till the besieged were forced to surrender, this Disease grew so grievous; that in a short time after, either side left off, and from that time, for many Months, fought not with the Enemy, but with the Disease; as if there had not been leisure to turn aside to another kind of Death, this deadly Disease increasing, they being already overthrown by Fate, and as it were falling down before this one Death. *Essex's* Camp moving to the *Thames*, pitched in the places adjacent, where he shortly lost a great part of his men; but the King returned to *Oxford*, where at first, the Souldiers being disposed in the open Fields, then afterwards among the Towns and Villages, suffered not much less; For his Foot (which it chiefly invaded) being pack'd together in close Houses, when they had filled all things with filthiness, and unwholsom nastiness, and stinking Odors (that the very Air seemed to be infected) they fell sick by Troops; and as it were by Squadrons. At length the Feaver, now more than a Camp Feaver, invaded the unarmed and peaceable Troops, to wit, the Entertainers of the Souldiers, and generally all others, yet at first (the Disease being yet but lightly inflicted) though beset with an heavy and long languishment, however many escaped. About the Summer Solstice, this Feaver began also to increase with worse provision of Symptoms, and to lay hold on the Husbandmen, and others inhabiting the Country. Then afterwards spread through our City, and all the Country round, for at least ten Miles about. In the mean time, they who dwelt far from us, in other Counties, remained free from hurt, being as it were without the sphere of the Contagion. But here this Disease became so Epidemical, that a great part of the people was killed by it; and as soon as it had entred an house, it run through the same, that

that there was scarce one left well to administer to the Sick; Strangers, or such as were sent for to help the sick, were presently taken with the Disease; that at length, for fear of the Contagion, those who were sick of this Feaver, were avoided by those who were well, almost as much, as if they had been sick of the Plague.

Nor indeed, did there a less Mortality, or slaughter of men accompany this Disease; because Cachectick and Phthilical old men, or otherwise unhealthful, were killed by it; also not few of Children, young men, and those of a more mature and robust age. I remember in some Villages, that almost all the old men died this year, that there were any left who were able to defend the Manners and Privileges of the Parish, by the more anciently received Traditions.

When this Feaver first began, it was something like the Figure of a putrid Synochus; but it was harder to be cured: and when it seemed to be helped by a Sweat or Loosness, presently it was wont to be renewed again; but for the most part, after the deflagration of the Blood, continued for six or seven days, this remitting, and instead of a Crisis, the adust matter being translated to the Brain, the Sick for a long time keeping their Beds with raging sometimes, but more often with a stupefaction, with great Weakness, and sometimes with Convulsive Motions, scarcely escaped at last. About the middle of the Summer, besides the Contagion and frequent Burials, this Disease betrayed its Malignity, and Pestilential force in open Signs, viz, by the eruption of Wheals and Spots; because about this time in many there appeared without any great burning of the Feaver, an unequal, weak, and very much disordered Pulse; also without a manifest expence of Spirits, their strength presently became languishing, and very much dejected: In others, Sick after the same manner, appeared little Blisters or Measles, now small and red, now broad and livid: in many, Buboes (as in the Plague) about the Glandula's: of these some died silently and unforeseen, without any great struggling of the Spirits, or Feaverish Burning excited in the Blood: in the mean time others, by and by becoming furibundous, whilst they lived, suffered most horrid Distractions of the Animal Spirits. Those about to escape from this Disease, without any laudable Crisis (unless they were the sooner freed by a Sweat provoked by Art) the Brain, and nervous stock becoming disordered, at length, with a benumbedness of the Senses, Tremblings, Vertigo, Debility of Members, and Convulsive Motions, did not grow well but of a long time after. During the Dog-days, this Disease being still infectious, began to be handled not as a Feaver, but as a lesser Plague, and to be overcome only by Poyson-resisting Remedies; letting of Blood, was believed to be fatal to this: Vomits and Purges, sometimes though not often, were made use of, but the chiefest means of Cure, were accounted to be procured by Alexiteriums, and timely Sweat. For this end, besides the Prescripts of Physicians, to be had at the Apothecaries, some Empirical Remedies deserved no small praise; then first of all, the Pouder of the Countess of Kent, began to be of great esteem in this Country; also of no less note was another Pouder, of the colour of Ashes, which a certain Courtier staying by chance in this City, gave to many with good success; and to others approving of the use of it, he sold it at a great price; the sick were wont having taken half a dram of this, in any Liquor, to fall into a most plentiful Sweat, and so to be freed from the virulency of the Disease; That Diaphoretick (whose Preparation I afterwards learnt from the Cozen German of the Author) was only the Pouder of Toads, purged thoroughly with Salt, and then washed in the best Wine, and lightly Calcined in an earthen Pot. The Autumn coming on, this Disease by degrees remitted its wonted fierceness, that fewer grew sick of it, and of them many grew well; till the approach of the Winter, when this Feaver almost wholly vanished, and Health was rendred to this City, and the Country round about fully and wholly.

Thus you have seen the Beginning, Progress, and End of this Feaver, at first only a Camp-Feaver, but at length became Pestilential and Epidemical. That at first the Disease began in the Souldiers Camp, may seem to be imputed not only to their Nastiness and stinking Smells, but in some sort to a common Vice of the Air, for as these Feavers come not every year, their Original may be ascribed, partly to the peculiar Constitution of the Year; because by that means a more light intemperance of the Air being contracted, though it did not affect the more healthful Inhabitants; yet in the Army, where evident Causes, viz. Errors in the six non-naturals, very much happen to the general procacartick Cause, there is a necessity for these kind of Sick-nesses easily to be excited. For the constitution of this year, was in the Spring very moist, and slabby, almost with continual shours, to which a more hot Summer succeeding, and the infection of the Feaverish Contagion here first increasing, still grew worse, and disposed all Bodies the more for the receiving it; wherefore, that this Disease was almost proper to this Region, and at this time Epidemical, the seed of it ought to be ascribed to its first rising from the Army, being quartered round about. But forasmuch as it afterwards being made Pestilential, and very Epidemical, it infected most of the People living here, and killed not a few, the reason was, the evil affection of the Air; which because of the intemperance of the year, being unwholsom, besides by the continual breathing forth of stinking Vapors from the Souldiers Camp, and the quarters of the Sick, it became at last so vicious, that the infection of the Feaver, being dispersed in it,

was greatly exalted, and arose almost to the virulency of the Plague. *Diemerbrochius* relates from the like Camp-Feaver, arising in the Summer at *Spires*, afterwards another Malignant and Pestilential, and then the Plague it self to have accrued. Also, it was a sign that this Feaver of ours, became at last equal to the Plague it self, besides the great force of the Contagion. and the frequency of Burials, most wicked Distempers of the Blood, and nervous Liquor, being brought presently upon all, by it: because, strength being suddenly overthrown, the weak intermitting Pulse, the creeping forth of Measly Blisters, the eruption of Buboës, argued the Coagulation, and corruptive disposition of the Blood: besides, the Delirium, Madness, Phrensie, Stupefaction, Sleepiness, Vertigo, Tremblings, Convulsive Motions, and divers other Distempers of the Head, shewed the great hurt of the Brain, and nervous Stock.

That the Figure or Idea of this malignant Feaver, may be painted to the Life, very many Observations or Histories of sick people are easily to be had; of the many Examples of this Disease, I shall only mention a few, which hapned some years since in the House of a venerable man, and as with a mournful slaughter, so not without some admiration.

About the Winter Solstice, in the Year 1653. a Youth of about seven years old, without any manifest cause, found himself ill, being troubled with a pain in his Head, Sleepiness, and mighty Stupefaction; with it he had a Feaver, though not strong, with an ordinary burning, which grew more grievous, only by wandring fits, sometimes once, sometimes twice in twenty four hours space: presently from the beginning, he slept almost continually; also he was wont in his sleep to cry out, to talk idly, to leap often out of his Bed; being awakened, and sometimes of his own accord awaking, he presently came to himself, and constantly called for drink; his Urine was red, and full of Contents, his Pulse equal, and strong enough; in his Wrists appeared light contractures of the Tendons, and in his Neck, and other parts of his Body, some red Spots like Flea-bites. At the first, was ordered a light Purgation, and a frequent taking down of the Belly, by the use of Clysters; he daily took Cordial Juleps, with Poyson-resisters; Veficatories or blistering Plaisters were applied to his Neck, and other Plaisters to the Soles of his feet: on the sixth day, a little Blood streamed from his Nostrils; on the seventh, without any manifest through Crisis, the Feaver very much abated, the heat so gentle as to be perceived only by the Touch; also the Urine pale, thin, and without any sediment, yet he was much more grievously troubled with sleepiness, and a stupefaction of the Head, so that his Urine, and the Excrements of his Belly came away involuntarily; however, being called upon, he knew the standers by, and answered to their Questions: These Distempers, notwithstanding the Remedies, every day grew worse: About the fourteenth day, the sick Youth became so stupid, as neitherto be able to understand, nor to speak, yet he swallowed still what was put into his Mouth, though unknowingly, and his Pulse was laudable enough: About this time, he fell into a Flux, excited of it self by Nature for four days, which at last ceasing, a whitish Crust or Scurf, and as it were Chalky, began to spread over the whole Cavity of his Mouth and Throat, which being often in a day wiped away, new presently broke forth: when he had thus for four days more been sick, he became better in his Intellect and Sense, so that he was able to know his Parents and Friends, to take notice of their words, and to do something as he was bid; but as his sensitive Faculty began to be restored, so he began to grow worse as to his Speech and the Organs of swallowing; without doubt the matter being fallen from the Brain, into the beginnings of the Nerves, a Palsie in the Tongue and Throat had succeeded to the heaviness and stupefaction: which Distemper in a short time so increased, that afterwards the sick person could not swallow at all, but that what he took in at the Mouth, presently flowed back again, neither could any thing go down into the Stomach; when besides the cruelty of the Disease, there was danger lest he should be killed by Famine, an Instrument was prepared of a Pin of Chalk, put into a little pliant Wand, and on the top of it a little tuft of Silk made fit; and this being thrust down his Throat, opened the closing for a time, whereby the Food taken in, was suffered to pass; after the use of this for a day or two, he was able to swallow again, and afterwards to take his Food well enough; and within a few days, he began to speak, to discern any thing, and becoming wonderful hungry, to ask for, all day long, all sorts of Food, and greedily to devour whatever was brought to him. In the mean time, by reason of his long Sickness, and the nervous parts being grievously hurt, he was grown so lean, that the Bones scarce sticking to the Skin, he represented exactly a living Skeleton. But afterwards, by the sedulous, indefatigable, and prudent Care of the Mother about his Diet, he recovered perfect Health, and is yet living, and well.

When this Child had hardly arrived to the height of his Sickness, his Brother, elder about two years, on the Ides of *January*, was taken almost after the same manner: At first he was troubled with a Torpor and heaviness of the Head, then growing Feaverish, with a sleepiness and stupidity; he began to talk idly in his Sleep, then being awake hardly to come to himself: after four or five days, these Symptoms grew more grievous; he was able to understand little, nor scarce to speak articulately, and not without stammering. His Urine was thick, cloudy, without Hypostasis, or settling of the Contents: There appeared, as in his Brother, red spots, small,

small, like Flea-Bites: his Excrements both of his Belly and Bladder, came away involuntarily: but his Pulse was yet strong and equal; his Hypochondria were stretched out, and inflated with a tumor of the Abdomen; about the eighth day, he had a small stream of Blood: on the eleventh day of his Sickness, he fell into a Diarrhæa, by which, in the space of five hours, he cast forth seven times, bilous, thin, and highly stinking stuff, from whence there was some hope of his amendment; but the next day after, the flux of his Belly ceasing, pains and torments cruelly infested his Belly, that crying out and moaning night and day, he sent forth most heavy complaints; his Hypochondria and Abdomen were tumid like a Tympany, and mightily distended; when he could not receive any thing of ease, from no Remedies, the most exquisite Skill of many Physicians being tried, on the fourteenth day he died Convulsive; in these Torments.

A little after his Death, viz. on the thirteenth of *February*, his Brother, elder than him, about eleven years old, a Youth of great hopes, began to be Feaverish; and as the others, with a torpor and heaviness of his Head, though less strongly affected; but the heat in the Blood was greater, which was of a more hot temperament, and greater perturbation appeared, that for the first six days, besides heat and thirst, he was troubled with a continual endeavour of excretion, now by Sweat, now by Stool. His Urine was red and troubled; some red Spots, as in the rest broke forth; on the seventh day he had a bleeding about five Ounces, which ceasing, a great benumbedness succeeded, that for all that day and the night following, he could scarce lift up his Eyes: On the eighth day, a most plentiful bleeding followed again at the Nose, that there was danger, lest he should have lost his Life, together with his Blood; the Blood sprang so copiously from his left Nostril, that being received in a Basin, it made little Bladders or Bubbles by its fall: when he had lost above two pound of Blood, and being taken with a cold Sweat, began to lose his strength, Remedies were at length administered, and the Flux was yet hardly stopped. The Hæmorrhage being stayed, the Youth slept soundly, and all that day became sleepy; yet often awaking, he remained well in his Senses, and was quick in sense, and understanding; and being asked of his health, he said he was pretty well; his Urine, which was before red and troubled, then appeared pale, thin, and with a laudable Hypostasis, that the Sick seemed (especially because he wanted thirst, or immoderate heat) to be perfectly cured and freed from the Fever: on the following Morning, being the ninth day of the Fever, he remained yet torpid; but being raised up, he living cheerfully and intemperance, seemed to be in a condition of growing well, but that he began a little to falter in his Speech: in the Evening, when it was least suspected, the Fever being again enkindled, on a sudden he fell into a Lethargy, that he was scarce able to be awakened from sleep, and being pulled, scarce to know any body, or to speak plainly; although so great a loss of Blood had gone before, the Pulse was yet quick, high, and vehement; also the Urine red; after deriving and withdrawing Remedies had been used all that night, this Youth seemed to be in a little better condition, so that in the morning, he continued a long time from Sleep, but began to rowl about his Eyes hither and thither, and to set himself up a little; yet without speaking, or knowledge of those that were about him: before noon, his Eyes being shut again, he wholly lost the use of every Animal Faculty: he lay for three days as it were Apoplectick, with an high and vehement Pulse, with a palpitation of the Heart, and a difficult and painful breathing; his Pulse at length growing lesser by degrees, he died the thirteenth day of the Fever.

On the fifteenth of *February*, his Sister somewhat lesser than he was, began to complain of a pain and torment in her Belly, a trembling in her hands, and a painful tension or stretching out of the Muscles of her Neck, with a feaverish intemperance and thirst: on the last day of *February*, she growing plainly into a Fever, could not keep out of her Bed: moreover, she was troubled with a wandring heat, now in her Face, now about her lower parts; also she became heavy and somnolent, and awaking from sleep, could not presently come to her self. On the first of *March* she was lightly Purged and with ease, with an expression of Rhubarb: her Urine was thick and red; also petechial red spots (as in the rest) were conspicuous: we gave her after that, for four days, at several times, to wit, after the interval of every six hours space, ten drops of the Spirit of Harts-Horn, in a spoonful of Cordial Julep; the aforesaid Symptoms afterwards leisurely remitted, and this sick Child, though slowly, recovered health without any manifest through Crisis.

About the same time her little Brother, younger than any of these, fell sick almost after the like manner; who, yet, a Loosness arising naturally of it self, for many days, voyding Cholerick and greenish stuff, was easily cured. Also in the same Family, many other Domesticks, and some Strangers coming to help them, the evil being propagated by Contagion, fell sick of the same Disease: who notwithstanding, at length became well, though with difficulty, and slowly, without any regular Crisis being made.

That this Fever was malignant, plainly appears by the Contagion, Mortality, and Appearances of Spots, and many other signs; though that infecting Contagion, whereby it spread from one to another, shewed it self slow, and of lesser efficacy; because, between the Sicknesses of each

each of them, many days, and oftentimes weeks hapned to be, that the Infection of this though acute Disease, and the dissemination on others, was scarcely finished in four months space, in the same House. The Feaver about the first beginning seemed gentle and mild, not very terrible as to burning; but the matter being heaped together, from the deflagration of the Blood, became presently untameable, hard to be exterminated, also enemical to the Brain and Nervous Stock; wherefore in each of them, the beginning of the Disease was to be known rather by the torpor and somnolency, than the fervor and heat; also the Crisis, though by several ways attempted, *viz.* by Sweat, Flux, Bleeding, did not happily succeed, but for most part, the Blood growing turgid with the Critical Motion, endeavoured to transfer the Feaverish matter, upon the dwellings of the Animal Spirits; yet it self notwithstanding, became not putrefied by this means, but that about the standing of the Disease, both humors (to wit, the Blood, and Nervous Juice) being vitiated, by an impure mixture together, and grievously touched, caused the event of the Disease, to be either deadly, or extream dangerous.

C H A P. XV.

Of the Measles and Small Pox.

IN the next place, we refer the Small Pox and Measles to the Rank of Pestilential and Malignant Feavers, which indeed are mixt Distempers, consisting at once according, and contrary to our Nature. As to their Original, they have their Seminary born with us: but as to the effect, they produce preternatural Symptoms, and (as the Plague it self) poysonous; so that they constitute as it were a certain peculiar kind of Feavers, proper indeed to men, but after another manner, than *Porphyrius* has assigned; for it happens for every man only, and once to be distempered with the Small Pox or Measles: if perchance any one lives free their whole life, or another more often fall into these Distempers, they are rare and unusual events of Nature, which lessen not common observation; yea 'tis fully confirmed, to wit, that all, and only men are obnoxious to the Small Pox and Measles, and are wont to be rid of them at one Sickness. Concerning the Small Pox, we will treat of them apart from the Measles, what the Cause of them is, then what Signs and Symptoms they have, and lastly, what things belong to the Crisis and Cure.

Concerning the Causes, we ought to consider in the first place, what is the secret leading Cause, to wit, which renders only and all Mankind, and that once, obnoxious to this Disease. Secondly, We will enquire concerning the evident Causes, *viz.* by what and how many ways, this latent and occult disposition is wont to be, now sooner now later, deduced into Act. Thirdly, It shall be declared, what is the conjunct Cause, to wit, by what motion and alteration of the Blood, the figure of this Disease is produced.

1. As to the first, This disposition or natural predisposition, which inclines humane kind to this Disease, seems to be a certain evil or impurity of the Blood, conceived in the Womb, among the first Rudiments of Generation; almost all Authors would have this ascribed to the Menstruous Blood; which Opinion seems not altogether improbable; because in a Womans Womb (otherwise than in most other living Creatures) there is generated a certain Ferment, which being communicated to the Mass of Blood, affords to it Vigor and Spirit, and then at set periods, procures a swelling up, and an excretion of the superfluous Blood; but at the time of Conception, when the *Menstrua* wholly cease, very much of this Ferment is bestowed on the *Fœtus* or Child; and its Particles being heterogeneous to all the rest, as a certain extraneous thing, are confused with the mass of Blood and Humors; with which being involved, and separated one from another, lurk or lie hid a long while; yet afterwards at some time, being moved or stirred up, by some evident cause, they ferment with the Blood, and induce to it an Ebullition, and then a Coagulation, from whence very many Symptoms of this Disease arise.

These Fermentative Seeds sometimes are few and gentle, and so involved with other little Bodies, as they do not easily appear, and are brought into act; sometimes they are more and stronger; so that on the least occasion they are ripened into this Disease; hence indeed some are taken sooner, with the Small Pox in their tender years; others more slowly, and not till full or more ripe Age; also some easily receive the Contagion, but others converse often with the sick without danger. The sooner that any one hath this Disease, the more secure they are; wherefore Children most often escape; old men, or such as are of years, are more in danger, *viz.* in Children or young people, Transpiration is more easie, also the habit of the Body

more

more firm and healthful. But altho the venomous seeds of this Disease, for the most part are wont to be dispersed or blown away at once, and with one sickness; yet it sometimes happens, that a part of the infection being still left, the sick have fallen into this Disease twice or thrice.

2. The evident cause which stirs up these fermentative seeds, and most often brings them into act, may be said to be threefold, *viz.* The contagion received from some place: the disposition of the Air, and the immoderate perturbation of the Blood and Humors. It is most manifest by daily experience, that this Disease doth come upon others, and spread abroad by contagion; *viz.* from the infected Body, continually flow *Effluvia*, which being received by other Bodies, presently like poyson, they ferment with the Blood, and suscite or awaken the lurking or sleeping Seeds of the same Disease; homogeneous with themselves, and dispose them into the Figure or Idea of this Disease: neither is the Infection only communicated by contact, but at a distance. They who live within the same House, or neighbouring to the Sick, easily receive the Infection; also it is cherished in Cloaths, and dissipated afar off, and transferred to more remote places. They who are of kin one to another, soonest infect each other; also they who are fearful, and extremely dread this Disease, more readily fall into it: For by Fear, the Particles of the Infection are conveyed inwardly from the superficies of the Body. At what time the Contagion spreads, and that the Small Pox are Epidemical, all other Diseases almost degenerate into this. Secondly, a certain peculiar disposition of the Air, notably induces the Small Pox; hence most often it becomes popular, and rages ordinarily through whole Regions, Cities and Villages; hence also it more often exists in the Spring and Autumn: because at that time especially divers manners of little Bodies, and by that means tumultuating flow about in the Air, which we draw in with the Air, and so various effervescencies of the Blood and Humors, and Idea's of Diseases are raised up. Neither doth this Disease become only more frequent and Epidemical for these Causes, but also it gets a manifold Nature, that sometimes the Small Pox are deadly, and as it were pestiferous, and sometimes they are more mild and benign; to wit, as they have contracted more or less of Malignity from the Air; hence also sometimes black and livid Wheals or Pustles appear, and have much of the Nature of the Plague. Thirdly, Sometimes, though the Tinder of contagion be absent, and that no malignant Constitution of the Air had gone before, yet by reason of the Blood and Humors being immoderately disturbed, the Small Pox do arise: so I have known some to have fallen into this Disease, from a Surfeit, or immoderate exercise, when none besides in the whole Country about, hath been sick of it, to wit, the Seeds of this evil, lying hid, without any previous infection, being stirred up by a too great fervor of the Blood, and being associated, gathering together, easily defile, and infect the whole Mass of the Blood, with their Ferment,

3. So much for the secret leading, and evident Causes, but as to the conjunct Cause, *viz.* which is the formal reason of this Disease, or the manner of its being made, the business seems a little more intricate. It is commonly wont to be compared to Must growing hot, or Beer when it purges in the Vat: for if you put to these Liquors any thing of Ferment: as their Particles are heterogeneous, and of wonderful activity, presently they diffuse themselves through the whole substance of the Liquor, they exagitate the more thick and impure Bodies, against which they are dashed, beat them asunder, and roul about them, until a flowing being made, they drive the same from the intimate embrace or company of the Liquor, to the outmost Superficies. After the like manner the heterogeneous Seeds of this Disease, are thought to ferment the Blood, and then by a certain eruption of Wheals or Pustles, like the flowing, purifies it. But indeed, if we should more strictly consider the Business, there will appear here a great difference; because the infection of the Small Pox, is as it were a Ferment, or corruptive, and compels the Blood to grow hot, not towards perfection, but depravation; for when the Particles of this venomous infection strike against the receiving Subject, they presently raise up little Bodies like to themselves, and born with us, with which being associated, they pass through the whole Mass of the Blood, and make it to grow highly turgid, and to boil up, and after some time growing fervent, to go into parts, and to be coagulated, *viz.* the dispersed Seeds of the Poyson, dissolve the mixture of the Blood, presently profligate the more pure Spirits, then they joyn its more thick Particles to themselves, and by their adhesion, render them as it were congealed: The portions being so coagulated, together with the infolded Seeds of the Poyson, being left by the rest of the Blood, in its circuit, between the extremities of the Vessels, are affixed to the skin: by which means, if Nature being strong enough, doth cast forth the whole poyson, with the congealed Blood, the remaining Mass of the Blood, although made poorer, remains however in a condition to continue Life and Health; but if the Blood, being too excessively congealed, cannot be purified after this manner; or if portions of the Blood growing together with the Poyson, do not fully break forth, or at last do stagnate within, they wholly corrupt the Liquor of the Blood, or else being affixed to the Viscera, and especially to the Heart, they destroy their constitution and strength.

Portions of the congealed Blood, with the Poyson, begin to break forth about the fourth day (now sooner, now later) because Coagulation is not presently induced, but after some time,

in which the Venom unfolds it self, and ferments the Blood with its Effervency: First; light portions of the infected Blood, and those but few in number, like to Flea-bites, are fixed in the Skin; quickly after more appear, and those first broke forth, by the accession of new Matter, and by the continual appulsion of the congealed Blood, increase, and are elevated into a tumor; then these Whelks at first red, being by degrees increased, at length grow white, *viz.* the Blood being thrust forth of the Vessels with the Poyson, by reason of the heat and stagnation, is changed into Matter: about the seventh day after the eruption, the white tumors grow crusty, into a dry Scab; for the more thin part of the matter being evaporated, the rest grows hard, which then having eaten, and broke off the Cuticula, or outward thin Skin; falls away from the flesh or next Skin.

When the infection of the Small Pox is at once impressed on the Blood and Spirits, it very rarely can be blotted out, or dissipated by Medecines, or Blood-letting; but that its hidden disposition, will break forth into act; wherefore at first it diffuses it self by little and little, and inspires the mass of Blood, as it were with a Ferment, hence an ebullition and growing hot are produced in the whole Body, the Vessels are distended, the Viscera provoked, the Membranes pulled, until the Seeds of the Contagion, by fusing and coagulating the Blood, being at length involved with its congealed portions, are thrust forth of doors. The Essence of this Disease will be better laid open, if that I shall recount the Signs and Symptoms, which are to be observed in its whole course, and shall add in order the Reasons and Causes of them, on which they depend; but they are those which either indicate the Disease being present, or that foretell its state and event.

As to the Diagnosis of this Disease, by which it may be known, whether any one at first falling sick, will have the Small Pox or not; at that time are to be considered, the force of the Contagion, and the concurrence of the Symptoms first appearing; for if by reason of the evil constitution of the Air, this Disease doth spread abroad every where, none then is taken with a Fever, without the suspicion of the Small Pox, especially if they never had them before in their lives; but if this Disease be more rare, and without fear of Contagion, yet its unlooked for Assault quickly betrays it self, by these sort of Signs and Symptoms.

1. There is a wandering and uncertain Fever, sometimes strong, sometimes more remiss, observing no reason of increase, or growing continually hot, so that the Sick are now highly hot, by and by without any evident cause, they are without a Fever; the cause of which is, for that the fermentative Seeds are not agitated by an equal motion, but like fire half choaked, now increases more, and now are almost quelled, and ready to expire; until the burning spreading more largely, the flame every where breaks forth.

2. A pain in the Head and Loins, is so peculiar a Sign in this Disease, that it almost alone, in a continual Fever, signifies the approach of the Small Pox; the reason of which is commonly imputed to the greater Vessels being very much distended by the effervency of the Blood; but indeed it appears not, wherefore the same trouble is not caused equally in other parts, by reason of the like distention of the Vessels, and wherefore in the Small Pox, more than in a burning Fever, or in other Fevers, where the Blood grows more hot, these kind of pains should increase; yea, it may be observed, that great pains, now in the Head, now in the Loins, do urge, when the Blood but little swelling up, the Vessels are not amplified, *viz.* in the beginning of the Disease, when the Feaverish distemper is not yet conspicuous, while the sick as yet go abroad, and are well in their Stomach, upon the first coming on of the Small-Pox, they betray themselves by these kind of Pains. Wherefore, the cause of these kind of dolorifick pains, seems rather to subsist in the nervous stock, *viz.* in the Brain, and spinal marrow, and that by reason of the membranes, and nervous parts being pulled or hauled by the particles of the poyson, these pains do arise. For it is most likely, that the innate seeds of the Small Pox are chiefly hidden in the Spermatick parts, and that first of all, the Contagion lays hold on, for the most part, the Animal Spirits; hence, the first effervescency is stirred up in the Juice, wherewith the Brain and nervous parts, but especially the Spinal marrow are watered, and from thence the evil is communicated to the mass of Blood; wherefore, this Disease beginning, the Head and Loins are tormented with cruel pain; afterwards, the venom being translated into the Blood the Feaverish effervescency is stirred up in the whole.

3. Great anxiety, and inquietness, and sometimes a swooning, infest the sick, *viz.* by reason of the perturbed motion of the Blood, as also its equal mixture, beginning to be solved, by the Poysonous ferment, the Blood from thence being apt to stagnate in the Heart, and to be hindered in its Circuit, causes these affections to be thus excited.

4. Cruel Vomiting, also when the Ventricle is free from an impure ballast of Humors, very often accompanies this Disease; the reason of which is, because the fermentative seeds, being stirred up into motion, by the little Arteries gaping into the coats of the Ventricle, are deposited by every appulse of the Blood, and raise up Vomiting, as if the particles of Stibium had been swallowed; but afterwards, as soon as sweating being procured, the Poyson is driven forth outwardly, this Symptom ceases, and the Sick are well in their Stomach, without any purging forth of the noxious matter.

5. With

5. With these may be ranked, the Symptoms which shew themselves, according to the various habitudes of the Body, after a diverse manner, as heavy sleepiness, terrors in sleep, deliriums, tremblings, and convulsions, sneezing, heat, redness, a sense of pricking over the whole Body, involuntary tears, a sparkling, and itching of the eyes, a tumor or swelling up of the Face, a vehemency of Symptoms from the beginning, that the Disease seems presently to have attained his strength: the reason of all which may easily be elucidated, if what hath been already said concerning the Symptoms of Feavers be observed; with respect to the diverse tempers of the Sick, their habit, and age, as also the condition of the year.

2. As to the Prognosis of this Disease, by the Symptomatic Signs, it is indicated to be either salutary, or mortal, or of a doubtful Event.

1. The business promises well, when this Disease has benign circumstances; to wit, when it happens in a good constitution of the Air and Year, and at what the Small Pox are less malignant and pestilential; as in the year 1654. at *Oxford*, about Autumn, the Small Pox spread abundantly, yet very many escaped with them: but before, in the year 1649. this Disease was more rare, yet most died of it. Also, there is less danger, if it should happen in the age of Childhood or Infancy, or in a sanguine temper, and good habit of Body, or in a Family to whose Ancestors the Small Pox have not proved mortal: Besides, if in the whole course of the Disease, the Symptoms prove laudable, if in the first Assault, there be a gentle Feaver, without cruel Vomiting, Swooning, Delirium, or other horrid Distempers; if the Feaver about the fourth day be allayed, with the Symptoms chiefly urging, and then some little red spots begin to appear; if on the second day of the coming forth of those little red spots, they become more conspicuous, which afterwards grow together by degrees into little Pimples, and are ripened into Matter; if about the tenth day, or thereabouts, after the Eruption, the white tumors begin to scab, and by little and little from thence to fall off; if after their first coming forth, the Small Pox are soft, distinct, few, round, sharp-pointed, lying only towards the skin, and not in the inward Parts, you may be confident the Sick will do very well, and is in a good condition.

2. The appearances, which in the Small Pox, signify the business to be suspected, and full of danger, are of this sort; if there be a malignant constitution of the Air, that this Disease becomes Pestilential; and many die of it; if men of more ripe years, or middle Age, be taken with it; if it happens in a cold and melancholick temper, or in an impure or evil humor'd Body, where the Blood is not rightly circulated, nor transpiration truly performed, or if the Hypochondria or Præcordia are obstructed, some of the Viscera infirm, or troubled with an Ulcer, or if the habit of the Body be too fat, the Small Pox happen not without great danger of Life; nor is it less to be feared, when presently after the beginning, a great Feaver, cruel Vomiting, Swooning, a dejection of strength, Phrensie or Delirium come upon them, and that these desist not, upon the full coming forth of the Small Pox, for these signify a too great perturbation in the Blood and Humors; also, a confusion and contumacy of the morbid matter, which can neither be subdued, nor easily separated from the mass of Blood, or equally extruded from it: if there be an anxiety, and great uneasiness, with an inordinate boiling up, and growing hot of the Blood; also a great thirst, a difficulty of breathing, also a flux of the Belly, or Dysentery, they shew that sweating is hindered, and that the malignant humors reſtagnate towards the inward parts: The small Pox breaking forth slowly, argue the crudity and untameableness of the matter, and the impotency of Nature, and 'tis much more a sign, if they come forth double, and continued, in too excessive quantity and confusion, and also if there be a disordered expulsion, and irregular, of that matter, when not in certain issues, but every where undistinguishable. The Pox being hard, signify the incostion of the same matter, being depressed, a weak expulsion; and they are the worse, if in the midst of them appear black spots; or if purple spots familiar to the Feaver, or the Plague, are sprinkled among the Pox, they indicate a great malignity and putrefaction of the Blood, such as is wont to be found in the Pestilence. Lastly, the Pox being black, livid or green, are of an evil omen, because, besides the coagulations of the Blood, they argue its deadliness and corruptions, as in a Gangreen or Pestilent-Plague-Sore; if when the small Pox being come forth, they presently grow dry, and the swelling of the parts remit, it shews a going back of the malignant matter, or of the congealed Blood, with the Poyson, and a reſtagnation of it to the inward parts; from whence, unless a more free Diaphoresis or sweating be excited, that it may be thrust forth of doors again, Death for the most part quickly follows: For from hence the Blood being more coagulated, enters into putrefaction, also it is apt to be hindered in its motion, and to ſtagnate in the Heart and Vessels. If after the coming forth of the small Pox, a flux of the Belly, or a bleeding at Nose, comes upon them, it is an evil sign, because, by this means the Venom driven outwardly, is again called back inwardly; but sometimes I have observed these Symptoms to have hapned, with great ease to the sick, viz. Nature being before oppressed and burthened; after this

manner, part of the burthen being as it were detracted, she was eased; wherefore, she buckled her self to the work of sweating, and more readily expedited the expulsion of the noxious matter.

As to the Curative part, since the stadium or course of this Disease, hath three Seasons, as it were so many measures, distinct one from another, the Curative intentions ought to be accommodated to each of these; wherefore the Curative Method concerning the Small Pox, teacheth first, what is to be done so long as the Blood boyls up, and grows hot inwardly, with the motion of the fermentative matter, and before the small Pox appear, which period for the most part is finished in four or five days.

Secondly, what means or manner of Diet and Physick is to be instituted, after the coming forth of the small Pox, until the state or standing of the Disease, *viz.* whilst the Wheals or Pox come to the height, and being fully suppured or ripened, begin to dry.

Thirdly and lastly, what we must observe in the declining of the Disease, even whilst the small Pox growing dry, fall off.

1. As to the first, let the Intention be, that we may carry away every impediment of Nature, whereby the Blood being infected by the Ferment of the small Pox, and apt to be coagulated, may yet retain an equal motion in the Heart, and without stagnation in the Vessels, and growing hot, may expel forth of doors the congealed portions with the Poyson; in the mean time, there must be a caution, lest the work of fermentation or growing hot be any ways hindred, or too much provoked; for by this the Mass of the Blood is agitated into congealed portions, more than it ought to be; by that other it is restrained too much in its motion, nor are the invenomed Particles sent forth of doors with the congealed Blood; Nature in the work of secretion and expulsion, is wont to be hindred by too great an heap of excrements in the Viscera, or by the abundance of Blood in the Vessels; wherefore upon the first assault of the Disease, care must be taken, that if need be, an evacuation by Vomit or Stool, be timely procured; but only more mild Purges, and gentle are to be used, which do not too much provoke, or disturb the Humors: wherefore, at this time, Purges, Emeticks, or Clysters, now these, now those, take place; also the letting of Blood, if there be a fullness, is performed with good success.

During this growing hot of the Blood, Diet ought to be instituted slender and moderately cooling, *viz.* Barly-Broth, or Grewel of Oatmeal, Posset Drink, Small Beer, or the like: Flesh, and Flesh-Broths are to be avoided, whereby the Blood, by reason of the too great plenty of sulphureous Food, may be enkindled more than it ought; also all cold, and sharp or acid things are hurtful; for these congeal the Blood more, and contract the little mouths of the Vessels by their astriction or binding nature, that the small Pox come forth less freely; also hot things, and Cordials are cautiously to be administred; for by these the Blood and Humors are too much agitated, and driven into confusion.

2. When the Small Pox begin to appear, there are three things, which by a constant Rule we prescribe to be performed to every sick person, to wit, that a soft and gentle Sweat be still continued in the Blood; also, that the Throat and Eyes may be preserved from a too great eruption of the Small Pox. That the Blood lightly growing hot may emit the Small Pox, Decoctions of Figs, Marigold flowers, and shavings of Harts-horn in Posset-drink, are commonly prescribed, and the use of them is general for a long time, almost with all people; for the same intention, we are wont sometimes in a day to give them moderate Cordials; but the more hot and strong are carefully to be shunned: Purging and Blood-letting here are most wickedly enterpriz'd, and these, though Necessity compelled, Physicians dare not meddle with for fear of blame: For to defend the Throat and Guttural parts, we put on the outer Skin a defence of Saffron dipped in Breast-Milk, and sewed in a Rag; for these, by opening the pores, draw away the venom outwardly, from the most inward part or the Throat; also for this end, we administer Gargarisms, and things to wash the Mouth, which by their restriction, restrain the coming forth of the Small Pox within: we defend the Eyes with peculiar Medecines, of Rose-water, and Breast-Milk, with Saffron, and such like, frequently iterated, from the incursion of the Small Pox: Besides these, sometimes certain most horrid symptoms do trouble, which must be timely helped with convenient Remedies; sometimes there are present, Watchings, Phrensie, Bleeding at Nose, Vomiting, Loofness, and a falling back of the Small Pox: for these and divers others, as occasion arises, a prudent Physician knows how to provide; in which however there is need of great caution, lest whilst we take care of the smaller matters, the great work of Nature should be disturbed by a too great molestation of Medecines. For in all this time there is one and a continued Crisis: wherefore nothing is to be meddled with rashly. There is required the most care and circumspection of the Physician and Nurses, or those that administer to the Sick, when this Disease is at its height or standing, *viz.* lest that when the Small Pox be fully come forth, and brought to their greatest height, transpiration should be hinder'd; for then the sick are in danger of renewing the Fever, and

and of the restagnation of the Malignant matter within, whilst we study to prevent the one, we for the most part bring on the other.

3. When the Disease shall be in its declination, and the Small Pox begin to wither and scab, the business for the most part is out of danger, nor is there much need of a Physician; let the sick, though he grow very hungry, content himself still with a slender Diet, and without Flesh: if the Scabs fall off slowly, we are wont to ripen them with Liniments, and peculiar Medecines, to make them fall, and care should be taken that they leave not behind them too great Pits: after the Sick having the Scabs every where fallen off, and are able to rise and walk about the Chamber, the filthy Excrementitious Matter in the Bowels, is to be carried away, by two or three times Purging, and then they may be permitted to use a more plentiful and stronger Diet.

The Measles are so much akin to the Small-Pox, that with most Authors they have not deserved to be handled apart from them, but that either Distemper have been treated of together, after the like manner and method. The Essence and Cure differ at least accidentally, or as they are greater or lesser; because in the Measles the Whealks rise not up to so great a Bulk, neither are they suppurated; wherefore the Sickness is sooner ended, and with less danger. this Distemper is wont mostly to spread upon Children, more rarely amongst those of years, or old men; also those who first have had the Small-Pox, are not afterwards so obnoxious to the Measles; but in most things, either Distemper are of kin, *viz.* the Evil being contracted in the Womb, disposes men only, and all men once to the Measles; the malignant constitution of the Air, and sometimes a Surfeit, and most often the Contagion, are wont to bring the hidden disposition into act; there are present marks of malignity, and the Sickness oftentimes becomes Epidemical, and with Mortality and Contagion.

That I may briefly contract the Sum of the Matter, it seems that the Measles are a certain lighter flowing, of an extraneous ferment, contracted from the womb; by which, some Particles being stirred up into motion, make the Blood lightly to grow hot, and to be a little coagulated; wherefore the Marks from thence spread abroad, are dissipated without any breaking of the Cuticula, or outward Skin, by evaporation only; but the Small Pox are a more full and strong agitation, according to all the Particles of the same Ferment, which causing a great ebullition and coagulation of the Blood, produces far more full whealks, and greater in bulk, and not to be dissolved, but by suppuration, or growing into matter: when the Small Pox precede, they are not only exempt from the same Disease any more, but also from the Measles, because they consume only some of the Particles of the Ferment, leave still a disposition to the Small Pox; wherefore old men, or those of years, are not so readily infected with the Measles, because they are either freed from the contagion, by having before had the Small Pox, or else the Infection of this more light Disease, is easily resisted by their more strong Spirits.

It were easie to illustrate the afore-cited Doctrine concerning the Small Pox, with Histories and Observations of the Sick, because there is no Disease besides can supply with a greater plenty of Examples, or variety of Accidents; but of the great number of this kind, I shall only propose in this place a few Cases; and those remarkable for some irregularities.

It is a usual thing to handle all that are sick of the Small Pox, with a like, or wholly the same method of Curing, and manner of Diet; wherefore, a Physician is rarely sent for to the common sort, but the business is wholly committed to some Women, professing themselves skilful in this Disease; and these are wont to boil in their Broths, and all the Suppings of the sick, Marigold-flowers, shaving of Harts-horn, and sometimes Figs; also every night to administer a Bolus of Diacordium; and they who grow not well by this kind of Government, though not neglected, yet are affirmed to be incurable, by reason of the cruelty of the Disease. But truly this kind of Practice is not convenient for all alike, nor to be administered to every one indifferently; as these two following Histories will make manifest.

A young Man, about 20 years of Age, of a slender Body, and more hot temperature, began to be Feverish in the beginning of the Spring, at first cruel Vomiting, an oppression of the Heart, and frequent changes of heat and shivering, a pain in his Loyns, a disturbance of his Fancy, and Wakings infested him; on the third day, the Small Pox appearing, those Symptoms remitted, but still the Fever, with heat and thirst continued. Not only the accustomed Decoctions in this Disease, but also a most elegant Julep, of a most grateful taste, were so nauseous and troublesome to him, that he would not so much as taste the same, but with a great deal of trouble; as often as he took going to sleep, Diacordium, or any other more temperate Cordial, for the continuing his Sweat, though in a very little quantity, the night following he was without sleep, and in great disquiet; and then in the beginning of the morning a Bleeding followed, by which means indeed, the Small Pox being full come forth, the Life of the sick was in great danger, by reason of this occasion hapning once or twice; where-

fore, when I had found by observation, his Blood apt to grow immoderately hot, by so light a provocation, I instituted this method as occasion served. All Medecines being let alone, he took for the quenching his Thirst, small Beer, and simple Almond-Drink, at his pleasure: for his Food, because he vomited back all Oatmeal Grewel, or Barly-Broth, he eat only Apples roasted tender, and drest with Sugar and Rose-water, often in a day. Nature being contented with this slender ordering, and being seen to be disturbed with any other thing performed happily its work, that the sick person grew well, without any grievous Symptom afterwards, the Small Pox from thence ripening, and then of their own accord falling off.

In the middle of Autumn of the former Year, a Gentile Young Man, being endued with a sharp Blood, and obnoxious to a frequent bleeding at Nose, fell sick of the Small Pox; his Blood of its own accord grew immoderately hot, that the Wheals very quickly broke forth over all his Body: Posset-Drink, with Marigold-Flowers, and other usual things boiled in it, also Juleps, or any Cordials, though temperate, and gently provoking Sweat, most certainly stirred up a Flux of Blood in this Person; wherefore I ordered the like manner of Diet, as in the sick person before cited, by which he found himself better; however, in the very state or standing of the Disease (when the Small Pox being fully come forth, by reason of a more difficult transpiration, the Fever is wont to be somewhat renewed in all) this sick man fell into a most plentiful Bleeding; that after a large profusion of Blood, the Small Pox began to flag or fall: After that Remedies, very many, were tried in vain, for the staying of the Blood, at length a little Bag being hung about his Neck (in which was a Toad dried in the Sun, and bruised) he first, and immediately perceived ease; though the bleeding was by this means stayed, and not any more returning (whilst he constantly wore this peculiar Medicine in his Bosom) our sick Man still using a most thin and cooling Diet, grew quite well; that indeed from hence it may appear, that although the Blood in this Distemper, is apt to be greatly coagulated, yet so long as the vital Spirits, being strong and robust, are able sufficiently to execute their government, they endeavouring by their proper strength or forces, do best of all separate and thrust forth the congealed portions of the Blood, as it were by a certain skilful separation; and this work is most of all hindered, when the same Spirits are too much irritated by Cordials, or more hot Food, and agitated into confusion: But in the Plague it happens otherwise, because in this, if any delay be granted, the Spirits themselves are presently profligated by the Venom; wherefore, here they must fight close and quick, when in the Small Pox, the Physician does his business better by delay.

Concerning letting of Blood, at the instant breaking out of the Small Pox, it is very dubious; formerly, among our Countreymen, this was esteemed a wicked business, neither were they wont to admit of Phlebotomy under any pretext of necessity: but of late, experience having taught us, in some cases, it is found, that to let Blood, hath been wholly profitable and necessary; which evacuation however, if it should be administered indifferently in every constitution, or when this need should be, it should be performed in too large a quantity, by that means oftentimes very great damage arises.

Some years before, I visited a young Gentlewoman, of a florid countenance, and more hot temperature, growing into a Fever, after the fourth month of her being with Child; she was troubled with a cruel Vomiting, a most cruel pain of the Loins, besides with most strong heat and thirst; her Pulse was swift, with a strong and vehement vibration or beating; altho the Small Pox had never been in that Place, yet these Symptoms gave no light suspicion of this Disease; however, its great effervescency indicated that Blood should be taken away; wherefore I took away about six ounces presently, upon which the heat remitted somewhat, yet the Vomiting, with a cruel pain in the Loins remained still: At the hour of sleep, I gave her a Cordial Bolus, with half a grain of our Laudanum, by which means quiet sleep followed, with a pleasant sweat, and an allaying of all the Symptoms: the next morning the Small Pox came forth with which, although the sick Gentlewoman was greatly distempered, yet she grew well without any dangerous Sickness, or fear of miscarrying, and went out her full time.

The last Autumn, a strong Man, of an active and robust constitution of Body, yet of a pale Countenance, and more cold Temper, fell into a Fever; on the second day he was tormented with heat and thirst, and a most cruel pain in his Loins: when I had prescribed Blood to be taken in a small quantity, the unskilful Chirurgeon, who was sent for, took from him almost half a pound; a little after, the sick man began to be all over in a cold sweat, on a sudden to lose all strength, to be troubled with a shivering, a weak Pulse, and unequal, and frequent swooning. At this time being sent for, I gave him a temperate Cordial, to be taken frequently. His Spirits and Pulse being thereby restored, the Fever was renewed, which afterwards, for some days, yea, weeks, exercised the sick man after a very irregular manner: for he was wont for three or four days to grow very hot, also to be infested with thirst, watchings, Head-Ach, and other Symptoms, then to be troubled all over with a copious and critical

cal sweat, by which indeed for half a days space he found himself better; but from thence, the Feaver still growing worse, heaped together again new matter, till it was dispersed by another Crisis, and then another. After that he had been thus feaverish for at least twenty days irregularly, at length the Small Pox began to come forth in several parts of his Body, here and there, and then the Feaver wholly remitted; yet within few days, by reason of some Errors committed in his Diet, very many of the Wheelks began to fall down again, few of them only being brought to maturity: However, instead of the subsiding small Pox, a mighty Bubo grew up behind his right Ear; from which, being soon ripened, and broke, a great plenty of Matter flowed forth for many days, and so at length the Corruptions of the Blood, unable otherwise to be dissipated, were carried forth by degrees, and the sick Person recovered perfect Health.

CHAP. XVI.

Of Feavers of Child-bearing Women.

Vulgar Experience abundantly testifies, that the Feavers of Women lying in are very dangerous, beyond the disposition of other common Feavers: also that the same differ very much, as to their Essence, from both a simple and putrid Synochus, plainly appear from their signs and symptoms rightly weigh'd: wherefore, I believe it not to be from the matter, to handle after Malignant Feavers, the acute Diseases of Women lying in, being exceeding near of kin to those, for their mortality or perniciousness. Yet, before I shall enter upon the unfolding these Diseases, it behoves us to consider their Subjects, viz. the Bodies of Women in Child-bed, after what manner they are predisposed, and by what provision they are made obnoxious to these kind of Sickneses.

Concerning this, the first thing that offers it self, is, that the Flux of the menstruous Blood is wholly convenient to be suffered by human kind, and at this time for Women, concerning whose Nature and Original we shall not enquire in this place; but it shall suffice to note, that in them, the particles of the Blood to be periodically thrust forth, are very Fermentative; which, if retained in the Body, beyond the wonted manner of Nature, are very often the cause of many Diseases; unless only when a Woman conceives with Child. For all the time of her being big-bellied, the monthly Flowers are stopped without any incommodiousness; and in the mean time, Milk, or the alible Juice, is disposed in great plenty, about the parts of the Womb, for the nourishment of the Child; but after the Birth, this daily suppression of the Monthly Flowers is recompensed by a copious flowing forth of the Lochia, or what comes away after the Birth; and the Milk within three days having wholly left the Womb, springs forth plentifully into the Breasts: at which time, Women lying in, are wont to be troubled with a small Feaver. If that the Milk be driven away from the Breasts, it restagnates again towards the Womb, and is thrust forth, together with the Lochia, under the form of a whitish humor. In the mean time, the Womb, after the Birth, becomes subject to various Distempers; for oftentimes its tone is hurt, the unity is dissolved, and many other Accidents are induced, which render Women lying in, subject to danger: wherefore, that their acute Diseases may be rightly unfolded, it is convenient to consider chiefly these three things, viz. First, The Nourishment of the Child, or the Generation of Milk, both in the Womb, and in the Dugs, and the Metastasis or translation of it from one to another. Secondly, The purging of the Mothers Blood, or the Profluvium of the Lochia, after a long suppression of the Menstrua. Thirdly, The condition of the Womb after the Birth, and its influence on other parts of the Body. And these being premised, we will speak of the Feavers of Women lying in, viz. both the Milky and the Putrid, called, and that deservedly, malignant, by reason of its deadlines.

First, the Milk and nourishing humour, being heaped up in the parts of the Womb, for the nourishment of the Child, are of a like Nature, though somewhat different in consistency. Milk is indeed more thick, because it ought to be received in at the mouth, and to be kept in the Ventricle, and afterwards its more thin portion to be conveyed to the mass of Blood. The other alible Juice is more thin, and like the Water of distilled Milk, because it is immediately poured into the Blood of the Embryo, through the umbilick Vessels, without any previous digestion. Either Juice is supposed to come from the Chyle fresh made in the mothers stomach; what is reposed or laid up in the Breast, is more thick and white, by reason of the more thin or open strainer,

strainer, and coction in the greater Glandula's; on the contrary, it happens in the Womb otherwise, where the Glandula's are smaller, and the straining more close. But there is a great disagreement among Authors, concerning the passages, by which this Humour is carried, both in the Breasts, and into the Cake of the womb. Some contend, that Milk only is begotten of the blood, more plentifully cocted in the glandula's, which yet, by reason of the immense dispense of Milk, which consists not with the Blood, this seems not probable. Others affirm, that the Chyle, or Milky humor, is immediatly convey'd from the Viscera of concoction, through occult passages, without any alteration, into either receptacles: But in the mean time, while these passages lie open, it seems indeed to me more likely, that from the meat taken into the Mothers Stomach, a portion of the Chyle thence made, is presently supped up into the Veins, which having obtained the Vehicle of the Blood, before it be assimilated by it, is laid up in the Glandula's, destined here and there for the receiving of it, being carried by the Arteries, and lastly separated from the Mass of Blood; for as it appears, that Drink being plentifully taken, presently passes through the whole Mass of Blood, and is rendred by Urine like Water; and as old Ulcers, by means of the Blood coming between, prey upon the nutritious Humor, from the whole Body, and powr it forth under the shape of a putrified Matter, why may not the alible Juice in like manner, being strained by the Collander of the Glandula's, before it has indued the colour of Blood, go into a Milky Humour? This indeed seems more probable, because, whilst the Milk is carried from the Womb into the Breasts, and on the contrary, passing through the Mass of Blood, it is wont to stir up a perturbation through the whole, with a Feaverish Intemperance; besides, in the first days, after the Birth, when the Glandula's do less rightly perform the Office of Secretion; Beasts, who have not the Lochia, give a bloody Milk, which is drawn forth of their Udders, that is, mixt with Blood, by reason of the plenty of it flowing forth together.

Secondly, As to what belongs to the Menstrua being suppressed, in the time of being with Child, and the Lochia plentifully coming away, after being Delivered, we say, that after the Conception of the Child, the Menstrua ought to be suppressed by Divine Designation, for that the flowing of them often causes Abortion; then, because the Vessels are filled by a continual stilling forth of the alible Juice into the parts of the Womb, the Mass of Blood doth not arise into swellings up, to be allayed by the Menstruous Flux. For the same reason, Women for the most part, have not their Courses so long as they give suck. Perhaps in some, indued with a more hot Blood, the monthly Courses flow, both whilst they are big-bellied, and in the time of their giving Suck, but that more rarely, and is wont not to happen without trouble; yet in the mean time, the Menstrua being suppressed, during the time of being with Child, because much less of the nutritious Humor is expended at that time for Milk, they much more deprave the Blood, than the same being restrained at the time of suckling the Child, are wont to do: yea, from them being long suppressed, in the former condition, an, as it were, envenomed taint is impressed on the Mass of Blood, which, unless it be purged forth by the daily Flux of the Lochia, presently after being brought to Bed, produces grievous, and almost malignant Distempers. Wherefore, that I may give my Opinion of the flowing of the Lochia, I say, that this Bleeding proceeds immediately from the Vessels being broken, by which the After-Birth did stick to the Womb, and that by this way, the excrementitious Blood and Humors being partly heaped up about the Womb during the time of being with Child, and partly flowing from the whole mass of the Blood, are evacuated; viz. whilst the Womb at first intumescied in its bulk, falls down presently after the Birth, and is contracted into a lesser space, the Blood is plentifully pressed forth from the Vessels opening into it. But besides, forasmuch as during the suppression of the Courses, the bloody mass is imbued with very fermentative Particles, as soon as after the Birth, the mouths of the Vessels are opened, forthwith, as it were at the instant of a more large Flux of Monthly Courses, the whole Blood grows hot (even as Must or new Wine upon the opening the Bottle) and endeavours to purge forth the highly fermentative particles out of its bosom, by the going away of the Lochia, as it were the flowing: And therefore, besides the Blood, which in the first days oftentimes flows pure, by reason of the fresh opening of the Vessels, afterwards is sifted forth matter very much discoloured, viz. livid and green, and this very stinking. This kind of Flux is wont to continue at least for fourteen days, yea, in some for a month; and if that by reason of any error, it be stopped before the mass of Blood be thoroughly purified by such flowing, presently a Feaver, very dangerous, with horrid provisions of Symptoms, is wont to be indued: of which we shall speak anon in its proper place.

The third Consideration, previous to the Doctrine of Feavers, belonging to Women in Child-bed, is chiefly about the Womb it self; to wit, how it is affected after Child-bearing, and what influence it has on other parts of the Body. As to the first, there are chiefly two Accidents, upon which the acute Diseases of Women in Child-bed very much depend, viz. First, The falling down of the Womb, or the reduction of it, from the bulk of ingravidation, to its natural

natural Site and Magnitude: Secondly, the solution of the unity, within its cavity, by reason of the breaking of the connexion, or tying to the Cake of it, or After-Birth. When the Child, with what wraps it about, is put forth, presently the sides of the Womb it self, before very much amplified or enlarged, do mutually close, and by the help of the Fibres, leisurely contract themselves into a narrower space; by reason of this kind of contraction, the Blood and Corruptions, or Matter are plentifully pressed forth from the Vessels and Pores of the Womb, and are thrust forth with the Lochia. But sometimes it happens, by reason of some preternatural thing contained in the Womb, as part of the Secundine, or After-Birth, a Mole or piece of Flesh, Clodders of Blood, &c. also, if there happen after a painful Birth, a Contusion or great Dilaceration, that the Womb cannot rightly draw it self together, but by an inverse motion of the Fibres, ascends upwards, and is lifted up into a bulk; also the membranes being affected with a Convulsion, it self is still tormented with Torments, as if it were yet in travel; which kind of Distempers, if they long continue, by reason of the Orifice of the Womb being tied together, with the Convulsive motion, the Lochia are oftentimes stopped also: from hence grievous Symptoms follow, and very often the Fever is either first excited, or it happens, being for some other cause induced, to be rendred far more dangerous. Secondly, as to the solution of the unity, from the Cake of the Womb being broken, it comes to pass, that the Birth, either at its just time, or precipitous, being too much hastened; then the Secundine is cast forth, either whole, or being torn, or pull'd away, part of it being left behind, it is cut off as it were in half. If the Child be born at its just time, and the Birth, with what enwraps it, comes away from the cavity of the womb, as ripe fruit from a Tree, whole, and without violence, the mouths of the Vessels are somewhat unlocked, and the Lochia moderately flow; but from hence no grievous Symptoms is to be feared: but if the Child, not being yet ripe for the Birth, is pulled away, or breaks forth as it were by force, although the Cake, with the membrane is pulled away whole, yet the Vessels being torn, a greater hemorrhage or bleeding, and at length an ulcerous disposition follows, the little mouths of the Vessels spewing forth a stinking matter. If that part, or the whole Secundine sticks to the sides of the Womb, after the Birth, it there putrifies, and sends forth very stinking matter or corruption, and stirs up wicked Distempers: oftentimes the Orifice of the Womb is shut up, and retains within gobbets of clodder'd Blood, little pieces of Membranes, or Flesh, which putrifying, by reason of the heat, impoyson the Blood and Humors, flowing together to that place, by Circulation, from the whole Body; also, by a troublesom itching or provocation, they stir up the parts of the womb, being so very sensible, into Convulsions.

When therefore hurt is brought to the Womb from Child-bearing, after the afore said ways, the same is quickly communicated to other parts, not without trouble to the whole Body; which thing indeed is wont to be done by a double means. For first, this happens, because the Lochia being hindred from being thrust forth, presently restagnate or flow back upon the mass of Blood, and infect it as it were with a virulent taint: moreover, from the contents putrifying in the Womb, either the substance it self of the Matter, or the Particles coming away from the cadaverous substance, are mingled with the Blood, and nervous Juice, passing through that place, and quickly infect their whole Liquors. Secondly, Hysterical Distempers are more largely extended, by reason of the notable consent, which happens between the Womb and the Brain, with the Fibres and Membranes of the whole Body, by the means of the nervous passage; for when the extremities of the Nerves, planted about the parts of the Womb, are driven into Cramps and Convulsive motions, by reason of the presence of some hurtful humour, the Convulsions there received, presently creep more largely upwards, by the endeavours and circumduction of the Nerves towards the Brain; and so it happens to the Viscera to be successively inflated, and cruelly haled together, and the Brain it self at length to be pierced, and its functions to be as it were overwhelmed; hence from the convulsive motions, arising about the Womb, an inflation of the Belly and Hypochondria, a rumbling, vomiting, sobbing, and streightness of the Præcordia, difficult breathing, a sense of choaking, and oftentimes a stupor, and want of Speech, or at least some of these are excited: nor does the Tragedy so easily leave, but that also the Brain being hart, by the continuance of the Distemper, by that means, the evil is retorted upon other parts, that oftentimes the whole nervous stock is compelled into irregularities of motions; for what commonly is said to be done by vapors, and the Distemper, called the ascent of vapors, creeping from the nether parts, to the upper, is nothing else than the parts of the Membranes and nervous passages, being successively driven into Convulsions. Further, in these sort of Distempers, the hurt action doth not always begin, or is at first perceived in that Region or Place where the hurt is inflicted, neither do the passions which are called hysterical, proceed only from the Womb; for sometimes the trouble is immediately brought from the Brain, or the convulsions and contractions begin in the extream parts, and sometimes the

extremities of the Nerves, somewhere in the Viscera, as the Stomach, Spleen, Reins, &c. no less than the Womb are haled; in which, irregularities being arisen, they are continued into the neighbouring part, and from thence to the Brain; from whence again the Convulsions are reflected to other parts, and not seldom through the whole Body. Just so the business in Child-bearing Women, and with others in Feavers, as I have often observed; to wit, some by reason of their Womb being evilly affected, but others by reason of a Feaverish matter fixed in the Brain, by a critical metastasis or translation, fall into Passions like to the hysterical. And these things being rightly præpens'd, concerning the prævious provision, in the Feavers of Women in Child-bed, there is not any thing that we should stick at in the entrance more, so that we take notice that the bodies of Women lying in (especially those who are feeble, and of a more tender constitution) are debilitated, chiefly after a difficult and hard Labour; so that, by reason of this occasion only, they easily conceive feaverish intemperatures, and being brought in by this or any other means, they are hardly able to bear them. We will next speak of the Feavers themselves, with which Women lying in, are wont to be sick, of which Distempers there are commonly recounted as it were three kinds, *viz.* the Milky Feaver, the Putrid, the Symptomatic, or of that manner by a certain borrowed symptom, but is chiefly marked with the Pleurisie, Squinancy, or the Small Pox: of which we will discourse in order.

The Milky Feaver.

WE have already said, that as yet it was uncertain of what matter Milk was immediately made, and by what passages it is carried into the Breasts, moreover when this part appears not at all to anatomical inspection, I am of the opinion, that the Milky Chyme, being made out of Aliments in the Bowels, and from thence confused to the Bloud for nourishing Juice, is presently again, for the most part of it, separated from its mass by the help of the Glandula's in the Womb, or in the Breasts, that it might supply the Child with nutriment, either in the Mothers Belly, or in her bosom by the Breasts. In the time of going with Child, although the greatest part of this is derived to the Womb, yet in the last months, a little quantity of it is laid up in the Breasts; but about the third or fourth day, after being brought to Bed, the Milk is more plentifully carried into the Breasts, and as it were with a certain force, that it quickly fills them to a stretching them forth, and begins to be troublesome. At this time, Women lying in (though not all, yet most) are wont to be troubled with a feaverish intemperature, with thirst, heat, and an inquietude of the whole Body, they complain of a pain very troublesome in the Back and Shoulders, of a fulness and burning of the Breasts: and unless the Milk be diligently drawn forth, it being too much congested or heaped up, oftentimes brings forth an Inflammation, with an Imposthume following of it in the Breasts. This Feaver, whilst the Lochia are in good order, hardly lasts three days, but that about that space it is wont to be allayed, a plentiful sweating arising of its own accord; yet this intemperature being excited by the coming of the Milk, is somewhat increased and continued longer, if that the Milk entering the Breasts in abundance, be not milked forth, but is again repelled from thence; for by its departure, as well as by its coming, a perturbation is wont to happen in the whole Body, with thirst and heat, which also more certainly comes to pass if it happens to be driven away violently, by repelling Topicks. But being driven by their help from the Breasts, or departing of its own accord, it is thrust forth, with the Lochia, in the form of a whitish humor, and a sweat, or more plentiful transpiration, exterminates the Reliques of the Disease. If that with this kind of intemperance, brought in by reason of the commotion of the Milk, the Lochia be stopped, or errors in eating and drinking be committed, or any other evident cause should happen, that may increase the fervor of the Blood, very often the Milky Feaver, presently acquiring worse Symptoms, changes into a Putrid or rather malignant Feaver.

The Cause, or formal Reason of the aforesaid Feaver (whilst the way of the Milk lies hid) may be only propos'd, from an Hypothesis, and as it were a certain Augury; for being supposed, that this milky humor is carried to the Breasts immediately, by a peculiar passage, from the Viscera of concoction, without any commerce with the Blood, this feaverish Distemper arises, for that the Breasts being filled with Milk, and greatly distended, the sanguineous Vessels are so compressed, that they do not easily transmit the Blood flowing thither; from whence, the Blood being hindered in its circuit, begins to tumultuate through its whole mass, and the Spirits being inordinately moved, and wholly confused, it conceives a fervor, such as being induced by a Stopping, Surfeit, Inflammation, or Wound, constitutes ordinarily the simple Synochus; but if the matter of the Milk (as it is not improbable) passes through the Blood, this Feaver of Women in Child-bed, seems to spring from hence,

that

that when this Latex is transferred to the Breasts, having left the Womb, a great portion of it subsists in the mass of Blood, which indeed, for that it exceeds the provision of the nourishing juice, and so cannot be wholly assimilated, and besides abounds in heterogeneous parts, and as it were something extraneous, and not mingleable with the Blood, creates a trouble, therefore for the carrying it forth of doors, and putting it forth, this three days feaverish Distemper is employed; For when the milky Chile, being used to be separated about the Womb, by and by, after being Delivered of a Child, that wax of excretion is hindred, restagnating into the mass of Blood, it is there first of all heaped up more plentifully, than that the whole may go into nourishment, or be received into the Breasts: wherefore, the Milk, not only in its passage to the Breasts, but also in its return towards the Womb, brings forth the Feaver, to wit, by reason of either passage thorow the Blood.

But however the cause of this Disease is ordained, it matters little or nothing towards the Cure; for this is wholly committed to nature, and so long as the Lochia are in good order, it proceeds for the most part happily, without any Physical help, because after the growing hot of the Blood, for three or four days, either a plentiful sweat, or a more free transpiration, cures this Distemper, to wit, either the Particles of the Milky humor, degenerate in the assimilating, or the adust recrements, remaining after the deflagration of the Blood, or both of them at once supplying the food or tinder of the Feaver, are by little and little subdued, and evaporated out of doors, which being excluded, the Blood becoming free from the extraneous mixture, quickly recovers its pristine condition; yet in the mean time, certain vulgar Rules are wont to be observed, about the admission of the Milk into, or the driving away of the same, out of the Breasts. If the Milk too plentifully springs into the Breasts, that their inflammation, as also the immoderate growing hot of the Blood, may be prevented, at that time, a more thin and sparing dyet, to wit, no flesh broths, and also in a less quantity, is to be ordered: also the Breasts are to be frequently drawn. If it be not commodious for the Mother to suckle her Child, it is usual after the first or third day of her being Delivered to cover all the Breasts over with Sear-Cloaths moderately binding (as the Plaister of Red-lead, &c.) for so the spongy substance of the Glandula's, is somewhat constrained, or closed together, whereby they less readily receive the milky humor flowing thither, yet this kind of Remedy ought to be cautiously administered, lest if the Milk be wholly excluded, or driven out of the Breast too abruptly, restagnating suddenly in the Blood, it induces its disorder, the prodromus or forerunner of the Putrid or Malignant Feaver: of which it remains that we speak next.

The Putrid Feaver of Women in Child-bed.

Women Lying in, from the fault of an evil affected Body, as by the Contagion of a received Pestilential Air, are found to be too obnoxious to the Putrid, or rather Malignant Feaver; but all do not alike receive the Infection of this sort of Disease; for poor people, Labouring Women, Country Women, and others accustomed to hard Labour, as also Viragoes, and Whores, which are brought to Bed clandestinely, bring forth without any great difficulty, and then, after a little time, leaving their Beds, return to their wonted Labours. But more rich Women, tender and fair, and most living a sedentary life, as if participating after a more grievous manner of the Divine Malediction,* bring forth in pain; and then presently after the Birth they are subject to difficult and dangerous chances; the reason of which seems to lie in this, that those who are used to much exercise, continually agitate and ventilate the Blood, and therefore fewer infectious taints from the monthly Flowers being suppressed, do gather together for the matter of a Disease; moreover, laborious and nimble Women, as they have their nervous parts more firm, therefore they are less subjected to convulsive motion, and to the passions commonly called hysterical; on the contrary, in delicate, and idle Women, the mass of Blood, in the time of their going with Child, becomes very impure and fermentible; besides, because they have the system of the Nerves, and the Brain soft and weak, upon every light occasion, they suffer distractions of the animal Spirits, and inordinate motions of the nervous parts. And here, by the way, it is to be noted, that Women more than men, and that some of the same Sex before others, are sensible of the affections called hysterical, not so much by the default of their Womb, as for that they are of more weak constitution of Brain, and nervous stock; for in those so affected, the passions of anger, sadness, fear, as also all troublesome and more strong objects, easily pervert the dispositions and functions of those parts, which when they are once hurt, for the most part afterwards, are accustomed to those irregularities. But we will return from whence we have digressed. The Feaver but now proposed, is wont to infect Women Lying in, indeed

at various times, and by reason of diverse occasions, now presently after the Birth, especially if it be difficult and laborious, now it arises in the first, now the second, third, or fourth week; yet the sooner it begins, the more safely it is wont to be cured. The Type or Figure of this Disease, is performed almost after this manner. After a previous indisposition, an open feverishness, for the most part with a shivering, or horror, constitutes the first assault, which is followed with heat, and afterwards succeeds a sweat: perhaps, for a day or two, they have various reciprocal fits of heat and cold; then the Blood being wholly inkindled, the Lochia, if not before suppressed, either flow smally, or are wholly stopt: If the Disease be acute, and of a swift motion, it comes to its height on the third or fourth day, then an intense heat, with a very troublesome thirst, a vehement pulse, and quick pertinacious wakings, a great inquietude of the whole Body, that they are continually tossing themselves in their Beds hither and thither, a thick Urine, and high coloured, and other most grievous symptoms, are wont to trouble them: whilst the Feaver is after this manner at its height, no Crisis is to be expected; for I never saw this Disease cured by a critical sweat, but that the business was still very precipitously acted, as after the Blood was grown hot for a little time, presently the adust matter being translated to the Brain, most dangerous and heavy inordinations of it, and the whole nervous stock forthwith come upon them; for most often are stirred up, convulsive motions of the Tendons, wonderful distentions, and inflammations about the Viscera, like to the hysterical passions; then sometimes, also follow a phrensie, or delirium, not seldom a stupefaction, and speechlessness; the strength is suddenly cast down almost in all, without any manifest cause, the Pulse becomes weak, and unequal; and the sick are suddenly precipitated to death; If that any perhaps escape, either by the returne of the Flux of the Lochia, or a Lask, coming upon it, they hardly recover but of a long time: I have known in some, purple spots to have appeared, and certainly in many, symptoms that respect either the Blood or nervous juice, which argue no light Malignity.

We will distinguish the causes of this Feaver, after the ordinary manner, into Procatartic, Evident and Conjunct. Those of the first sort, upon which the malignity, and the greatest perniciousness of the Disease depend, are two, *viz.* first, a depraved disposition of the Blood, from the long suppression of the monthly Flux. Secondly, after the Birth, the evil affections of the Womb, from the dangerous Labours of Women, (who undergo the Divine Malediction appointed them) from the Menstrua being long suppressed, the Blood not only swells up, and its Sulphureous parts being too much carried forth, are rendered more apt for burning, but besides, the mass of the Blood is imbued with very fermentative Particles, so that (as hath been already hinted) as if it were touched with a venomous infection, presently growing fervent, it is disposed towards putrefaction, and corruptive disorders; and besides, forthwith impoisons the nervous Liquor, and renders it infestuous to the Brain and the whole nervous stock. These kind of evils, being impressed on the Blood, ought to be purged forth, by the Flux of the Lochia; but if after the Birth, the Womb be out of order, the Lochia are not only stopped, and so a purifying of all the Blood is hindered, but besides, stinking corruptions or defilements, are thence bestowed on the Blood, and grievously infect it: Also, by reason of convulsive motions, begun about the Womb, and from thence continued to other parts, inordinations are stirred up in the Blood and juices, which oftentimes conspire, either the production, or the acerbation or growing worse, of the Feaver.

The evident causes, which induce an actual effervescency, either to the Blood, having gotten an ill disposition, or invert the vices of the whole Body to the Womb, are after a diverse sort. A painful Labour, a solution of the unity about the Womb, a bruise, a retention of preternatural things, an ulcerous disposition, and very many other accidents, which are induced by a certain necessity, may do this. But the occasions, that are at the dispose of the Patients, and easily to be avoided, which are wont to excite this kind of Feaver, are chiefly two, *viz.* an ill manner of Dyet, and the taking of cold. It is an usual thing, to give to weak Women, after being Delivered, on the first or second day, the flesh of living Creatures, or Broths made of flesh meats, and other foods, very impropportionate to their dispositions, from whence presently arise an indigestion, and great trouble in the Bowels, and a feverish distemper in the Blood by reason of a more rich nutritious juice than ought to be. Besides, the errors in Dyet, oftentimes hurt is caused, for that their Bodies, being so very tender, also by reason of the labours of the Birth, and bringing forth the Child, the passages are on every side opened, they are exposed too heedlessly to the cold: for most of them, being impatient of their Bed, within a day or two, or sooner than they should do, rise out of it, and put on their Cloaths, from whence, presently the Pores of the skin being suddenly contracted, and the Air being admitted into the parts of the Womb, transpiration is hindered, and often the Lochia, on the sudden are stopped, either of which suffices to excite the feverish distemper.

The conjunct cause, or formal reason of this kind of sickness, chiefly comprehends these three things, to wit, there are present, first, a very notable discrie of the Blood, that growing hot, from the Feaver being occasionally induced, it doth not equally burn forth, nor leisurely overcome the adust recrements, and afterwards critically thrust them forth; but the Blood growing hot, is presently loosned in its mixture, and its frame being unlocked, turns and declines towards corruption; hence, when it grows but a little cool, the spirits being shaken out of thier dominion, are moved into confusion. In the mean time, the Sulphureous Particles become untamed, and fierce, wherefore, the strength falls down without any manifest cause, the Pulse is made weak and disordered; after the deflagration of the Blood, altho the adust recrements are very much heaped up, yet nothing is rightly concocted or separated, but the sick being greatly oppressed in Nature, tho they continually sweat, receive nevertheless oftentimes no ease from thence; but the feaverish matter, which ought to be thrust forth, being transmitted into the head, and nervous stock, induces there most grievous perturbations of the animal regiment. Secondly, the Tragedy of this Disease owes no small part of it, to the nervous juice being presently made sharp, and so impropportionate to the Brain, and its Appendix; for this being infected, from the taint contracted from the Blood, doth not gently water, or pleasantly blow up its subjects, but notably hale or pull those tender parts, (as when an infusion of vitriol is poured upon a Worm) and irritates or provokes them into convulsions, and into motions, as if of dancing or suddenly leaping forth, and sometimes wholly overturns their functions; hence comes contractures, grievous convulsions, delirium, wakings, and sometimes stupification, and the sleepy Disease, upon Women Lying in. Thirdly, whilst these things are done, oftentimes a third band of symptoms infest the sick, to wit, for that the Womb, being hurt by some evil, moves it self disorderly, and is struck with a Convulsion; according to these or those parts, from thence by and by, convulsive motions invade, by the membranes, and nervous passages, the whole Region of the Abdomen; wherefore, the Viscera and Hypochondria are blown up, belchings, and grievous vomitings are stirred up, then the Distemper creeping upwards, and possessing the nervous parts of the Thorax, a difficult breathing, and unequal, a palpitation of the heart, a sense of choaking in the throat, by reason of the Muscles being there drawn backward, and other symptoms; through the whole Body are excited, the same evil being at last carried to the Brain.

The Feavers of Women in Child-bed almost never want danger; but sometimes it happens, about the beginning, that they are cured by a slender Dyet, and by the Flux of the Lochia being restored; but if the feaverish distemper does root it self more deeply, that the whole Blood is inkindled, and immoderately grows hot, the Prognostick ought not to be esteemed of a light Omen; and there will be a greater reason of danger, if besides the heat being suffused all over, the sick are troubled with a frequent shivering, if they are affected or molested with a great disquietness, and wakings, with sudden concussions of the Body, or a contracture of the Tendons: or if, Thirdly, they complain on the fourth days of a tingling of their ears, with a great repletion or fullness of the head, you may from thence collect the evil to grow worse, viz. a translation of the feaverish and hurtful matter to the Brain; nor is it less to be feared, if they have on them an oppression, and weight of the *Præcordia*, that the sick cannot breath freely, nor draw their breath deep, and from the bottom of their breast, but only from the top, and that frequently, and sighingly, and that they move themselves restlessly hither and thither: For this argues the Blood to stagnate in its circulation, about the Heart and Lungs, and also to be apt to grow into clodders, and to be coagulated, that if yet worse distempers of the Brain and nervous stock follow, and the Pulse should become weak and unequal, you may pronounce the business almost deplorable; but if (as sometimes tho it more rarely happens) after the Feaver being inkindled, and grievously threatening, either the Flux of the Lochia returns, or a Diarrhea with ease succeeds, some hope of health may be admitted, tho the same be at the last cast.

Concerning the Cure of these kind of Feavers, there lies a very great task upon the Physitian, because any Physick is esteemed with the vulgar not only unprofitable, but also hurtful for Women in Child-bed; wherefore, Physicians are rarely sent for, unless when there is no place left for remedies, and the opportunity of all profitable means be wholly past: If that perchance they should be present, about the beginning of the Disease, it will not be easie to procure health to the sick by vulgar Remedies, but whatever they should attempt, unless it should bring help, it would be said by the Women, and others about the person, to be deadly and the only cause of her death; that in truth there is wont to happen to us, less of profit, or more of ignominy, about the Cure of no other Disease, as in this.

But the method of curing (even as in Contagious Diseases) ought to be instituted twofold; to wit, Prophylactic or Preventive; and Therapeutic or Curative: The former of these

these, delivers Precepts and Cautions, whereby Women lying, may be preserved from the assault of Feavers: the other suggests curative intentions, whereby the sick (if it may be done) may at length recover health.

1. Although this Feaver be somewhat Malignant, it is not caught by Contagion, and there is no fear of the sick receiving outwardly any invenomed taint; notwithstanding, all Women in Child-bed have an innate mine of virulency, and from the evil of this, as it were the tinder of most high Malignity, they ought to beware; wherefore, they need an exact ordering, to wit, whereby after the Birth, the impurities of the Blood and Humors may be rightly purged forth, without danger of a Feaver; also, that the evil affections of the Womb may be healed, and that the strength being broken and debilitated by the Labour, may be restored after its due manner. For these ends, these three things are chiefly to be inculcated, for prescripts by Physicians.

First, I judge it necessary, that a most exact manner of Diet be commanded to Women in Child-bed; to wit, that they be wholly fed with Oatmeal-Cawdle, made sometimes of Beer, and sometimes of Water and White-Wine mixt together, also with Panada, and other light Nourishers, for a week at least; because they are much emptied, therefore it may be lawful for them to sup often, but nothing of solid or more strong food is to be given. For I have diligently observed that these Feavers have been ofteneft induced by the eating too soon Flesh, or strong Broths, or Food. Forasmuch as Women lying in, ought to be handled, not only as those that are grievously wounded, but as those that have got a Feaverish indisposition, from a disturbed disposition and temper of the Blood: For with them, the Blood being already too much carried forth, and as it were touched with an impure infection, most quickly catches Flame, by the access or means of any Sulphureous thing.

Secondly, After Diet, the care will be, lest the Pores be shut up, by the incautiously taking cold from without, or that the Lochia be stopped: for upon the least occasion, the manner of transpiration being changed, the Blood first growing hot, conceives disorders; also the Womb being touched by the blast of Air, contracts it self, and shuts up the mouths of the Vessels, whereby the Lochia flow forth less: wherefore, for five days at least, after being delivered, I would have Women wholly to keep their Beds. I know that it is a common custom to raise them from Bed on the third day, but by that means I have known many that have fallen into Feavers; and in truth, if we desire to keep Women in Child-bed from all danger, the safest means will be, that they may be kept long in their Beds.

Thirdly, Concerning Preservation, the intent remains, that by causing a gentle provocation of the Blood in Women Lying in, the Flux of the Lochia may be continued; for this end, Midwives are wont (if after a difficult Labour they fear that Evil) to give them *Sperma Ceti*, or Powder of *Irish Slate*, or Saffron steep'd in White-Wine; moreover, to make them Oatmeal-Cawdle, that may more fuse the Blood, of Water, and White or Rhenish Wine mixed together, in which they boil, or in Posset-drink also, Marigold-flowers, Leaves of Pennyroyal, or Mugwort; there are many other kinds of Administrations extant, about the ordering of Women in Child-bed, which being commonly known, I willingly pass over here.

The Cure of the subsequent Feaver of Women in Child-bed, is far from the usual method in Putrid Feavers: for in this, it is not to be expected, that the Blood being touched with a Feaverish burning, should by degrees burn forth, and the same should be separated by a Crisis, but rather (as it is done in a Malignant Feaver) as soon as the Blood grows immoderately hot, it is convenient for it to be moved by gentle Diaphoretick Remedies, and its heterogeneous and impure mixtures to be carried forth of doors; wherefore, among the common people it is a custom (and that not bad) to give to Feaverish Women Lying in, Sudorificks presently; by this means, the Blood being eventilated, its effervency is allayed; also, by reason of its agitation, the Lochia apt to be restrained, are provoked into a Flux. There is great difference among Authors, from whence the beginnings of these kind of Feavers ought to be computed, viz. whether from the Birth it self, or from the first sense of growing Feaverish? However it matters little whether it be after this or that manner: For since this Feaver runs not the usual stadia or courses of the Putrid, neither hath a Crisis, nor wholly admits the use of Cathartic or purging Remedies, we need not be solicitous so much for the days, concerning its period and mensuration. But yet, as to the Curative Indications, it will be of use only to distinguish what is to be done in the beginning, increase, and end of this Disease: also, what we ought to endeavour whilst there is some strength remaining, as also what, when 'tis oppressed, and very much dejected.

When therefore any Woman in Child-bed is first taken with this Feaver, (whose assault is known from the Milky Feaver, because for the most part it begins with a shivering) you must presently let it be your work, that the more plentiful sustenance may be drawn away from the burning Blood, and as I have already admonished, that the flesh of living Creatures, and Broths

Broths made of them, be utterly forbidden; yet in the mean time, all cold things, and that are indued with a stiptic or binding virtue, are equally to be avoided; for these fix the Blood, and bind it too much, and hinder its very requisite Purgation, both by the Lochia, and by transpiration through the skin. But rather, though the Feaver be urgent, give them Decoctions, Powders, and Confections of things moderately hot, of which sort are (as is already said) Decoctions, or distilled Waters of the Flowers of Marigolds, the Leaves of Penroyal, Mugwort, the Roots of Scorzonera, also Bezoartic Powders, Spirits of Harts-horn, fixed Salts of Herbs, &c. If the Lochia should be stopt, that their Flux may be again provoked, must be endeavoured every way: To the moving of this, conduce Frictions and Ligatures about the Thighs and Legs, sometimes Cupping-Glasses, or Blisters about the Thighs or Hips, also in the Soles of the Feet; also, sometimes the opening of a Vein in the Ankle, is convenient; in the mean time, a Fomentation of the Hysterical Decoction, is to be applied about the Pubis, or the Caul of a Weather or Sheep taken out warm, may be laid to the bottom of the Belly; and experience manifests, that sometimes Injections into the Womb are profitable: If the Belly yields not, it may be gently brought down, with a Violet Suppository, so-called, or an emollient Clyster; of more strong provocations you must take heed, because in Women Lying in, even as in a malignant Feaver, from a copious dejection, with loss of Spirits, Life is quickly lost. If with the suppression of the Lochia, there be a notable perturbation of the Blood, with Vomiting, thirst, and wakings, I have often known Laudanum mixt with Saffron, given with happy success. Instead of a cooling Julep, this kind of mixture is convenient, *viz.* Take of Water of Penroyal and Balm, each three ounces, of Hysterical Water two ounces, of the Syrup of Mugwort three ounces and an half, of the tincture of Saffron two drams, of Castor ty'd in a Rag, and hung in the Glass, one scruple, mingle these, and let them drink of this three or four Spoonfuls oftentimes in a day.

2. If notwithstanding the use of these Remedies the Feaver grows worse and worse, and by degrees is increased with worser Symptoms, that besides the disorders of the Blood, the Brain and nervous parts begin to be touched, Medicines, though many of every kind may be tried, do little; yea, in this case the indications are almost the same with those made use of in the Plague it self: forasmuch as the Lochia being for a good while suppressed, they cannot easily be reduc'd, or scarcely at all, in the great confusion of the Blood and Humors, therefore it is convenient quickly to move a Sweating, to wit, that the corruptions impressed on the Blood and nervous Juice, and restagnating from the Womb, may be carried forth some how, by sweat and insensible transpiration. Therefore here, Powders, and Confections of Bezoar, Spirit of Harts-horn, or of Soot, Tinctures of Corals or Pearls help. I have sometimes seen, by the help of these kind of Medicines, in a desperate case, when the Pulse, and other symptoms have appeared a little better, some small hopes to shew themselves; yet Cure rarely to follow: but when the use of these Cordials were left off, the sick with a weak pulse, and a Looseness presently arising, have been precipitated to Death.

3. When yet the business of the sick proves still worse, when the Feaver being increased, the pulse is weak and unequal, and frequent horrors, and convulsive motions in the whole body, with a delirium and stupefaction infest them, then the Physician having first made a prognostication of Death, may insist upon a few Remedies, and those only Cordials, and must wholly abstain from Blood-letting, Scarification, Blistering, or the use of Cupping-glasses; for such administrations beget only an odium or blame, that by so doing, we are esteemed by some Women, as wicked and cruel.

The Symptomatic Feavers of women in Child-bed.

THE Acute Diseases of Women in Child-bed, shew themselves not only according to the Figure of the aforesaid Feaver, but sometimes they are beset with some signal symptoms, to wit, the Squinancy, Plurisie, Inflammation of the Lungs, Dysentery, Small Pox, or of some other kind; and at that time, they get the appellations of those Distempers. It will not be here seasonable to repeat at large what belongs to the Essences and Natures of each; but I shall briefly shew what these sicknesses, being complicated with the Distempers of Women lying in, contain peculiarly, as to the Causes or Cures.

All these Symptoms, we suppose to proceed from a certain coagulation of the Blood, and from thence its extravasation; But whilst the Blood is extravasated, or put forth of the Vessels in one part, its efflux, however natural and critical, is hindered in another: wherefore it is dangerous, lest whilst the Blood begins to be coagulated, either in a particular or accustomed nest of Coagulation, or universally in its whole mass, the flowing of the Lochia be stopped, which

which in truth for the most part happens, and therefore these Distempers, for the most part, are deadly to Women in Child-bed; yet the Cause of their Death, for the most part, happens with some difference, *viz.* in the Small-pox, the flowing of the Lochia draws inwardly the malignity, begun to be carried forth outwardly, and forthwith compells the mass of Blood, and the Heart it self to be empoysoned with its evil; and therefore in the Small-pox, these purgings of the womb are convenient to be stopped; but in the Pleurisie, Squinancy, and the rest, when the provocative of the Disease being fixed here or there, in a particular place, draws to it self the impurities of the Blood, which ought to be separated or sifted forth by the Lochia, and derives it streight from the Womb, for that reason it increases the impurity of the Blood. The Lochia being stopped in the Small pox, by the more universal manner or way of excretion, may be shut forth of doors, with the venomous particles of the Disease, which thing indeed does not succeed in the rest, by reason of the minute, and more sparing manner of excretion.

Of these, the Squinancy, Pleurisie, and Inflammation of the Lungs, by reason, both of the great similitude of the Cause, and analogy of the Cure, may be considered together; when any Woman lying in is distempered with any of these, it is to be supposed, that besides the infection gathered together in the time of being Big-bellied, there happens a certain sowerish disposition of the Blood, by the means of which, whilst that it self grows feaverishly hot, certain Particles of it, being fused with the Sowness, enter into congelation; in this or that part, like Milk growing sour, and then to be coagulated: The Blood being there frozen or congealed, and hindred in its circuit, stops the passage of the rest; but the Blood being obstructed in its motion, butts against the impediment, and so being heaped up about it, and driven forth of the Vessels, grows into a tumor: from thence presently, whatsoever is contained in its mass, that is heterogeneous, and to be sifted forth, is laid aside into the distempered part, as it were a sink: wherefore, the corruptions of the Blood, that ought to be purged forth by the Womb, are derived from thence towards the nest of this Disease, which, when they cannot be sufficiently purged forth by this way, both more remarkably corrupt the Liquor of the Blood, and render the particular distemper, *viz.* the Squinancy, Pleurisie, or any other more hard to be cured.

For the Cure of these kind of complicated Distempers, presently from the very beginning, it should be endeavoured, that the Blood being fixed somewhere, and begun to be extravasated, may be restored to Circulation, that it may not impostumate; because, very rarely, Women lying in, are cured of these Symptomatic Feavers, by an Imposthume, or spitting forth of the corrupt Matter: wherefore, internal Remedies, which fuse the Blood, and free it from coagulation, are to be made use of; of which sort are chiefly Diaphoretics full of volatile Salt, as Spirit of Hart-horn, Soot, Urine, also the Salts themselves; in like manner, Shelly and Bezoartic Powders, Lapis Prunellæ, Decoctions and Juleps of Vegetables provoking Urine, or the terms, with all which ought to be mixed, what by experience are found proper for the distempers of the Womb: Besides, discharging Remedies, which may drive away the impacted matter, and disperse it (of which sort are Liniments, Fomentations, and Cataplasms) are diligently to be applied. In the mean time, the more impetuous motion, and immoderate effervency of the Blood, are to be removed, and its purgings, by all the wayes possible transferred to the inferior parts. For this end Frictions, Ligatures, Epispastics, and (if need be) Scarifying about the Feet and Legs, are to be administered; if the distemper very much growing worse, a taking away of Blood be indicated, unless there be a great fulness in the whole Body, and a very acute inflammation in the distempered part; it will be best to open a Vein in the Foot, or to take away Blood from the hemorrhoid Veins by Leeches: But if necessity urges, it may be done in the Arm it self, if after that Letting Blood (if another be admitted) let it be done in the Leg; but you are to be warned, that in these cases, the opening a Vein is to be ordered very cautiously, for unless it brings present help, (which I have rarely known it to do) immediately the Pulse being made more weak, the business of the sick becomes much worse.

The Dysentery takes its rise almost for the like cause, with the aforesaid distempers; but in this, because the extravasated Blood is presently poured forth, nor being retained in the Body becomes there troublesome, or is any more corrupted, and as this Flux makes an excretion near the Womb, and does not afterwards drive it to any other place, there is less of danger to be feared, from this Disease, than from those aforesaid: yet oftentimes this Disease, is fatal to Women in Child-bed, for that indeed, the rather, because things attempering of the Blood, and moderately binding, are ordered for the Dysentery: for these are found too apt to inhibit the Flux of the Lochia; wherefore in this case, until the Women Lying in are sufficiently purged by a long Flux, the Cure of the other Disease is to be omitted, and the fierceness of the symptoms is to be allayed, only with gentle allwaging things.

The indications of the Small Pox, do not only differ from those above described, but indeed they

they are beset with contraries to themselves; for they require (as hath been said) that the Flux of the Lochia should be moderately staid; yet in the mean time, that the flowing forth of the Blood, and a gentle sweat ought to be continued; for when in this Disease, the invenomed ferment is twofold, and the corrupt Particles of the Blood, are carried outwardly in a twofold way, you must beware, lest that the lesser, and straiter part, should draw to its door, the whole matter, or more than it were able to send forth: therefore, lest the Lochia flowing more plentifully, should recall inwardly the venom, apt to flower outwardly, the manner or way of Dyet is somewhat to be changed, and especially those things which have a poyson resisting force, and are also astringent (as the roots of Tormentil and Bistort) are to be boyled in the Broths of the sick; also Powders, Juleps, and Opiats, indued with such like virtue, are convenient to be administred at due intervals, yea, in this case, by no means, Women should be indulged, that they might eat flesh, or Broth made of it, or to rise out of their Bed: but the quiet, both of mind and Body, is to be procured, as much as may be, and a Dyet to be ordered of those things, that move not the Blood, and the business almost wholly to be committed to God and Nature.

What hath already been said, concerning the acute Diseases of Women in Child-bed, may easily be illustrated with Histories and Observations: But examples which may be brought in this thing, for the greatest part, are mournful and of an ill chance: because those Feavers for the most part end in Death. But to describe these kind of sicknesses, does neither confirm the work of the Physitian, nor render approved the method of Medicine, altogether taken in them; however, because the knowledg of these may make for the better discovery of this Disease, I shall here propose some singular cases of Women Lying in, and variety of symptoms; in which, altho the forms and means of Cure more sparingly occur, yet we may have some rules of precaution, of no contemptible use.

A Gentlewoman in her six and twentieth year of her Age, brought forth her sixth Child, with very difficult Labour, and not without danger of her Life; yet presently after, she began to be better; on the second day she eat a whole Chicken, on the third rose out of her Bed, and sat in a Chair for four hours; the night following she found her self ill, at which time her Milk came into her Breast; which, by the application of Diaculum Plaisters, soon vanished; the next morning she complained of a weariness and as it were an ulcerous pain of her whole Body, also of a vomiting, nauousefulness, and fulness about the Ventricle, and Hypochondria: the following night was full of trouble; on the fifth day she was plainly in a Fever, she felt now a shivering, now a heat, every where increasing, she nauseated every thing, and was troubled at her Stomach; moreover being unquiet, and without sleep, the Lochia flowed little, but a whitish humor (commonly called the Flux of the Milk) came away: In the evening she had a weight, and as it were a sleepiness about her forehead and temples, and began to sleep a little; but awaking in half an hour, being disturbed with Phantasms, she complained of her head, as if increased in bulk, also of her jaws being set, that she could not open her teeth, and her fists being strongly clutched, she seemed as if she felt a pricking and stupor, or numbness in her whole Body; her Ventricle and Hypochondria stood still inflated, and stretched forth; they administred to her Frictions, Ligatures, Cupping-glasses, and other Remedies, both inward and outward, that might recall the Lochia, and drive the recrements of the Blood from the head: Her Pulse being weak, and disordered, would not admit of Letting Blood; Powders, and Juleps, which might gently move sweating, and fuse the Blood and nervous juice, and hinder them from restagnating, were diligently given her; yea, fomentations, now of Woollen Cloaths dipped in emollient Decoctions, and now of warm inwards of living Creatures, were applied to her Belly; in the mean time, stinking things (such as they use to the Mother Fits) were put to her nose, which might drive away the impetuosity of the Spirits and Blood, carried into the head, but these, and other things, being for several hours carefully performed, she seem'd to feel some ease; but still she feared to shut her eyes, or to settle her self to sleep, for her eye lids being closed, a thousand Phantasms ran in her mind, with noise and tingling in her whole head: she continued that night almost without sleep; as soon as she had begun to sleep, presently being affrighted, and feeling a weight in her Precordia, she was awaked: on the sixth day about noon, she was troubled with a great shivering, or rather a horror, with a strong concussion of the whole Body; to which, as in the fit of an Ague, by and by heat, and then sweat copiously followed: but from thence, nothing of ease accrued to the sick, for presently after the sweat, the feaverish heat was renewed, and convulsive distempers infested her more: the night following, with the rest of the symptoms growing worse, first a Palsie was excited in her tongue, and by and by in her throat, that she could not speak, and scarce swallow at all: on the seventh day, about the same hour, a shivering invaded her again, with heat and sweat; then her Pulse being much weaker, and unequal; also a difficult breathing, and fetching the breath short and quick, with her Breast lifted up, she knew not them about her: on the eighth day she died.

There

There was a manifold occasion of the death of this Gentlewoman, predisposed to a Fever, by reason of her Big-belly, and which had increased the malignity of the Disease over and above; for the hurt received by her hard Labour, the sudden exclusion of the Milk from her Breasts, the eating of flesh, and the rising too soon out of her bed, hapning together made, as it were a conspiracy for the greater evil: The Blood being touched with a feverish burning, presently conceived inordinations, and snatched into it self the Lochia, and perhaps other defilements of the Womb, and so by that means acquired a greater infection, and plainly venomous disposition; the membranes of the Viscera, being imbrued with the degenerate nervous juice, were struck either with Convulsive motions, or with Convulsions continued to them from the Womb; for these kind of inflations, about the Abdomen, and those distentions are the effects of Convulsions: For altho the direct Fibres drawing the member, do oftentimes press it, yet since the Fibres are direct and transverse, and others placed in a various site, the membranes are pulled together into an hollowness, by their coming together, the part swells up like a blown bladder, into whose vacuity the Air being rarefied secundarily carries it self forward: But it is not the Air (as is commonly said) or a blast there at first heaped up, that is the cause of the distention: The Blood growing hot in our sick person, and being quickly filled with an adust and malignant matter, did endeavour to subdue it, and being unable to put it forth by sweat, forthwith fixed it in the Brain; the first suffusion of the same matter into the head, by reason of the animal Spirits being half overthrown, brought in that sense of her head being much increased in bulk; which thing happened by the like means as when the foot being taken with a sleepiness, seems as if it felt much bigger then it is: But that after some ease, the distemper grew worse, by sleep and closing of her eyes, the reason is, because waking, and the exercise of the senses, shake off and remove from them, somewhat, the matter besieging the Brain and Nerves; which notwithstanding being neer and in its precincts, sleep creeping on; is as it were supped up by them, and enters their Bodies more deeply with the alible juice. But the Blood, altho it had plentifully poured forth its recrements in the Brain, yet did not it self become free; but being still full, with an impure ballast, it conceived as it were a critical flowing, and attempted to shake off its burthen once or twice (as it is wont in a great excretion) with a shivering and with heat and sweat following it, by which endeavour however nothing was further effected, than that the matter sticking to the Brain, pierced more deeply into it, and becoming fixed in some little shoots of the Nerves, took away her speech and swallowing, and afterwards her senses; and the mass of Blood, being by degrees more and more depraved, at length became unable to sustain Life.

A Noble Gentlewoman, being married a little before she was twenty years of Age, and being with Child, used, during the time, an ill dyet, and little or no exercise; yet falling into Labour, and suffering the torments with intermission, and frequent ease for twelve hours, at length was brought to Bed of a Son: The Child, with the after-birth came away, and all things were right about the Womb: the first and the second day she found her self indifferently well, but on the third, after a light shivering, she began to complain of thirst and heat; to which a looseness followed, that she had that day four stools: the following night she was almost without sleep, the feverish distemper remained, after that in the same manner for two days; daily she purged three or four times; the Lochia as yet flowed moderately: when on the sixth day, by the persuasion of the Women, she had took some astringent thing, to moderate the Flux of her Belly, the purgings of the Womb were almost wholly stayed: at which time the Fever became more strong, and symptoms as it were hysterical, appeared; for in her Precordia, she had great and frequent oppressions, and was troubled with a sense of choaking in her throat; on the seventh day, the heat was yet stronger, and her breathing difficult and laborious; but then, by the prescription of a Physician, at that time first sent for, Blood was taken from her foot to three ounces; by which she was better for four hours; for a quiet sleep, with a plentiful sweat followed upon it, and the Lochia appeared again tho in small quantity: In the Evening again, all things grew worse, her strength being very much lost, her Pulse weaker and unequal; she complained also of a noise and tingling of her ears, with a fulness of her head, moreover a leaping up of the tendons in her wrists; also she had sudden concussions of her whole Body, yet still her looseness held; to her were administred, by the prescripts of several Physicians, Cordials, and other Remedies, and kinds of Administrations carefully, but nothing profited, her Pulse being more weak, and her strength leisurely wasting, she died on the ninth day, after she was delivered.

This Fever very much depended upon the vitious provision of the Body, as the pocratitic cause; for I have often observed, that it fares ill with Women Lying in, who when Big-bellied devoured fruit, and any unwholsome trash, and living without motion or exercise, indulged themselves with ease and rest: the Blood, by reason of the previous Cachexie, conceived a burning without any evident cause, as it were of its own accord: But growing hot lay-

ing inwardly still its recrements, and impurities, caused the Diarrhea: neither yet was its mass made more pure, by its almost continual excretion, yea rather being still more depraved in its mixtion or crasis, the blood at length wholly departed from its proper disposition, and became unable to be fermented in the heart, whereby heat and breath might be every where dispersed: The looseness, excited by the motion of Nature, was untowardly stopped, especially by the use of astringent things; for this I have often observed, never to be done without paying for it; because the Flux of the Belly has cured some that have been ill, but in this Lady, and in many others (as has abundantly appeared to our Experience) altho it did not take away the Feaver, yet it freed her from the more grievous Distempers of the Brain and nervous stock: from whence this sick person was wholly free from a Delirium, nor was struck with Convulsive motions, till reduced almost to extremity.

The Mother of a Family, and a Gentlewoman about 36 years of Age or upwards, being with Child of her seventeenth Child, was troubled, and very anxious, lest she should die of that Child-bearing: But (God favouring) she was delivered well enough of a Son, and for three days after she was very cheerful: on the fourth day, when she had eaten more than she should do of a Chicken, a little before night she fell into a feaverish Distemper, with vomiting and a stopping of the Lochia: all night she lay restless and without sleep, the next morning she had four stools, and seemed somewhat eased: about Noon (about which time I came to her) she complained again of heat and thirst, as also a palpitation of the Heart, and of the ascent of some substance in her throat; her Pulse was quick and small, her Urine red, the Lochia scarce appeared: I ordered her Juleps, Cordials, and things to purge the Womb, besides a fomentation for the bottom of her Belly, also her Legs and Feet to be rubbed often, with warm woollen Cloaths; at going to sleep I gave her of Laudanum one grain, with Saffron Powder half a scruple, in a spoonful of Treacle-Water: She slept well, and the Lochia came down plentifully, and by that means, with a slender Diet, and continuing to provoke moderately the Flux of the Womb for a few days, she became very well.

The immoderate eating of Flesh, as an evident and almost only sufficient cause, without any great provision, or vicious predisposition, induced the Feaver. The Lochia reflagging into the Blood, increased its intemperance, and presently brought troubles upon the nervous kind; but in the mean time, the Blood altho growing hot, did not undergo any great corruption, but when the Recrements, heaped up by the Surfeit, were sent forth by the Looseness, and the Blood, the Lochia being restored, began to be purged forth again after its wonted manner, this Feaver wanting a further malignant Ferment, quickly vanished.

A Noble Lady, young and fair, was brought to Bed of a second Child, and for six days, as to the Lochia and other Accidents, she was well, and wholly free from the suspicion of any intemperance, she ate flesh daily, and rising from her Bed, was brisk and cheerful in her Chamber: on the seventh day, without any manifest cause, a shivering came upon her, with a Feaver, and a lessening of the Lochia, but not suppressed: to the tenth day after her Delivery, she was only moderately feaverish; whilst the purgings of the Womb yet flowed, she remained free from any grievous Symptom: but then, although she was greatly feaverish, she was more cheerful than ordinary, and seemed more confident of her health: At Night she slept little or nothing; the Morning following (at which time I first visited her) she clearly raved, the Lochia were stopped, also her whole Body was shaken with horror, the tendons of her Wrists were pulled together, so that I could hardly distinguish her Pulse, which in the mean time was weak, unequal, and very quick. I said she would die quickly, unless God should miraculously restore her by his Divine Power; however, six grains of Oriental Bezoar being given her in a spoonful of Cordial Julep, brought upon her a plentiful Sweat, with a better Pulse; then other Cordials being given, with due intervals, gave some little hopes, tho I doubted they would not continue: after four hours from the time that I came, the sick Lady had of her own accord a great Stool, and presently her strength wholly failed her, and within half an hour she died.

When there happened nothing of ill to this Lady, as to her Delivery, or Womb, so pernicious a Feaver, and so suddenly mortal, could not happen without a great and malignant procataris of the Blood and Humors; whether a more full Diet, or taking Cold, or any other evident cause, gave a beginning to this, is uncertain; because, the Women and Nurses helping her, knew of no manifest occasion of her Sickness: The Feaver being inkindled, the infection of the Blood could not be wholly carried away, by the purging of the Womb, tho long continued; tho for that reason, the more cruel Symptoms came not presently upon her, yet the Evil still lurked within, and the Disease being very acute, shewing it self with a swift motion on the fourth day, when Nature should have endeavoured a Crisis, the matter of the Feaver being moved, but not overcome, as it were in a moment overturned at once, the Brain and nervous parts, whence Death was to be expected, and suddenly followed.

A Woman well known, who had scarce passed the twentieth Year of her Age, of a florid Countenance, and slender Body, after her being brought to Bed, when the Lochia flowed im-

moderately, made use of some astringent Remedies, by the counsel of those about her, by which means they were wholly stopped; but a Flux of her Belly succeeded, which when it had increased for three days, the Women gave her other things for the stopping her Loosness: nor were they frustrated in the success; in the mean time, in the place of the former evil, they had brought a most dangerous Feaver, and distempers as it were hysterical; for the unhappy Gentlewoman Lying in, was troubled with thirst, heat, wakings, and at several turns, with swoonings, and cold sweats; at this time being sent for, I prescribed her Cardiac Remedies, and such as moved the purgings of the Womb, and also a Clyster to be given her: at length, the Flux of her Belly being provoked, the Lochia also came down, and the sick Woman being freed from the aforesaid symptoms, and the more grievous Disease, to wit, the Remedies of the Nurses, quickly grew well of her Feaver.

The more plentiful Flux of the Womb, hapning to this Woman, removed the Procatartic cause of a more grievous Disease: wherefore, when they had committed so many errors about the ordering her, (*viz.* first in stopping the Lochia, then what might compensate their defect, in hindring the Flux of her Belly) yet the Feaver was only light, and without any venomous taint impressed on the Blood; the like to this I have known to happen frequently, to wit, when at first the purgings of the Womb have flown very plentifully, afterwards when they have flown very sparingly, and sometimes stopped, the Women in Child-bed have escaped. And by the way, it is here to be noted, that it is wholly dangerous, to inhibit, or at least divert, and cross any motion of Nature, incited, tho' irregular.

A Noble Gentlewoman, about Twenty Years of Age, indued with a smooth and full habit of Body, miscarried twice in the space of a Year; when she had again Conceived, by the prescription of her Physician, she provoked a Vomit once a Month, by drinking plentifully Posset-Drink, by which she was wont to cast forth much thick tough Phlegm; also in the time of her being with Child, he let her Blood five times; the time of her going being over, she was brought to bed of a Son, with very hard Labour; the Secundine came whole away, and she purged notably: on the second day, whilst she was lifted upon her feet in Bed, that the Sheets and the Blankets might be laid in better order, she took cold, and by that means the bloody Lochia wholly stopped, and only a little serous Water came away: on the third day she began to complain of an acute pain in her right side, to which the Women laid Bags of Camomil made hot with Bricks, but the distemper grew worse with a bloody spittle; on the fourth day of her being brought to Bed, a most sharp pain, with a difficult breathing, and very laborious, invaded her: by the prescription of her Physician, then coming to her from the neighbourhood, six ounces of Blood was taken away, out of the Basilic Vein, and she felt sudden ease; for ten hours she was better, in the middle of the night the pricking pain returned with its wonted fierceness: at length, other Physicians being called to Counsel, they agreed that it was necessary to open a Vein again, in the Arm of the distempered side: four ounces of Blood being taken away, the pain remitted, and the sick breathed better; then by Diaphoretic Remedies, she fell into a great sweat, with a quiet sleep: But the Pulse was made quicker and weaker, also contractures of the Tendons in her wrists appeared: presently afterwards she talked idly, and within twenty four hours, after she was last let Blood, she departed.

That this Lady fell into a Pleurisie, with a Feaver, upon the Lochia being suppressed, the cause in some measure seemed to be, the letting of Blood so often in the time of her being with Child: for by this means, the Blood being accustomed to be eventilated at the Arm, afterwards growing hot, leaving the Womb, was carried violently towards the place of its letting forth, where, when it found not a passage, it fixed in the neighbouring side, as the next next to the place of extravasation; yea, besides the usual manner of a Pleurisie, there was no small malignity hapned to this Disease; for the Blood being hindred from being let forth of the Vessels, began presently to be corrupted in its disposition, and in the third day of the Feaver, was so much depraved, that it could not be any longer fermented in the heart so as to prorogue life.

It was not so with the Wife of a certain Smith, who was brought to Bed, at what time her Children had the Small Pox in the same House, and she her self, as it seemed, had taken the Contagion of the same Disease, for on the second day after her Delivery, they began to break forth with a feaverish heat, and pain in her Loyns, which indeed for three days, whilst the Lochia moderately flowed, arose rightly into little swellings; altho' the purging of the Womb was very copious at that time, she had the Small Pox very thick all over her Body, not only in the superficies of her skin, but also they filled the cavity of her mouth and throat, so that she could scarce speak or swallow: The sixth day of her Lying in, the Lochia flowed immoderately, from whence presently fell upon the sick, a frequent swooning, with a flagging of the Small Pox, Convulsions, and other symptoms of an ill nature, which threatened Death soon; being sent for, I prescribed half a dram of this Powder, to be taken constantly every three hours, in a spoonful of the following Julep, *viz.* Take of the Roots of Tormentil in Powder, drams two, of the best Bole Armonie, dram one, of the species of Hyacinth half a dram, make a Powder. Take of the Compound Water of Scordium, of Dragons, of Meadow-sweet,

dow-sweet, each three ounces, of Theriacal Vinegar one ounce, of the Syrup of Corals two ounces, of Harts-horn burnt half a dram; make a Julep. Besides, I ordered to be boiled in her Broths, and in every thing she drank, the Roots of Tormentil; by these Remedies, the purging of her Womb was soon wholly stopp'd, and the Small Pox by degrees being ripened, came off without any grievous symptom.

Indeed this case was difficult, and was cured with great danger, *viz.* for either the Lochia, or the Small Pox to have been restrained inwardly, was very dangerous, and yet the more full eruption of the one, hindred the motion of the other; so long as either moderately proceeded, things being permitted to the conduct of Nature, was moderately well; but when one of them became ill, the work of Art was required, and it was requisite to bridle the Lochia, but to provoke the Small Pox.

CHAP. XVII.

Of Epidemical Feavers.

HAVING meditated rather a Commentary, than an entire Tract, I had thought here to have concluded our Discourse of Feavers: But forasmuch as certain Epidemical Feavers do often spread, which observe no Laws, nor can be brought to no certain Rule of Doctrine, but being irregular, vary every year, and for that reason, as often as any of them increase or spread abroad, presently it is call'd the New Disease; therefore I thought it worth our while, because general Precepts concerning these Feavers, are not to be delivered, to subjoyn some particular Histories, of some of this kind; for out of the various provision of Symptoms, whereby they are wont to be noted, the nature and the whole formal reason of these kind of Distempers, may somewhat appear. Since therefore of late years, within a short Tract of time, three popular Diseases have spread in these Countries, I will add, as a Crown to this Work, the several Descriptions of them, made at those times, when these Feavers raged.

A Description of an Epidemical Feaver, spreading about Autumn, in the Year 1657. taken in the middle of September.

WHILST we meditate the Description of a Feaver, at this time cruelly raging, it is fit, that following the example of *Hippocrates*, we first consider the foregoing constitution of the Year, its intemperance and excess of qualities. For Epidemical Diseases, and commonly excited among the people, are from a common Cause; such as the habit of the Year, and by that means contracted, a disposition of the Blood, by which many are alike affected. But that we may draw the Matter from the beginning, the last Spring, and the time succeeding it, even to the end of the Summer, was all that half years space extremely dry and hot, but especially after the Summer Solstice, the heats were so intense for many weeks together, that day and night there was none that did not complain of the heat of the Air, and were almost in a continual sweat, and were not able to breath freely: About the Calends of *July*, this Feaver, at first sporadical or particular, began to break forth in some places, that perhaps one or two were taken in the same City or Village: In many it imitated the likeness of an intermitting tertian Feaver, *viz.* the Fits returned every other day; which yet infested the sick with a most intense heat, without any cold or shivering going before; Vomiting and Choleric Stools plentifully hapned to most, sweat succeeding, but difficultly, and often interrupted, whereby the feaverish fit rarely ended in a remission, but that all the time between, the sick continued languishing and weak, with thirst and restlessness; in some, when the business began to grow better, after three or four fits, cold and shivering began the fits, and the Feaver became an exact intermitting Tertian; but in most, the Feaver still grew worse, and presently became of an evil nature, and difficult cure, with a depraved provision of symptoms; for when the sick were highly heated in their fits, and hardly sweated, they were wont to commit errors, which daily increased the strength of the Disease, because by reason of the impatience of the sick, and the unskilfulness of Servants, the sweat being interrupted, which should have ended the fit of the Feaver, after one fit was scarce finished, another presently succeeded, and so the Disease was wont to have wandring and uncertain periods, without any intermission between, and afterwards to pass into a kind of continual Feaver. The condition of which, sometimes

times being very dangerous, with an evil affection of the Brain and nervous stock, so that oftentimes a Lethargy, or Dilirium, or not seldom cramps and Convulsive motions, were excited: About the month *August*, this Feaver began to spread far and near, among the people, that in every Region and Village many were sick of it; but it was much more frequent in the Country, and smaller Villages, than in Cities or Towns. It was still like an intermitting Feaver, unless that it seemed more infestous than that is wont, and with more cruel fits, and shorter intermissions, and therefore was called the new Disease: besides, it underwent the note of a certain malignity, and gave knowledge of its Contagion and Deadliness; insomuch, that it crept from house to house, infected with the same evil, most of the same Family, and especially those familiarly conversing with the sick; yea, old Men, and Men of ripe Age, it ordinarily took away.

If you respect the nature and essence of the Disease, this Feaver properly should be referred to the rank of intermitting Feavers, for the Fits returned at set times, also for the most part they began with cold and shivering, and ofteneft with vomiting, and by and by a most intense heat proceeding they were finished, at last with a sweat. The Urine in most appeared of a flame colour, thin in the fits, with some hypostasis, without it more thick, and with a redish sediment; altho with a most copious sweat, and often iterated, the Disease was not cured, which might then be expected in a continual Feaver; yea, the distemper continued exceeding long, for many days, sometimes months, tho much evacuation almost daily happened by vomit and sweat; which we observe frequently in an intermitting Feaver, rarely to happen in a continual: out of the fit, at any time of the Disease a purge was profitably instituted, which in a Synochus before the sign of concoction, were a wicked thing to attempt; besides that this Feaver was of the intermitting kind, it seems to appear from hence, because that very many recovered of; that scarce one of a thousand died, which I scarce ever knew in an Epidemical Synochus. About the first beginnings of this Disease, it appeared very like to an intermitting Tertian, altho afterwards in some, by reason of the vitious provision of their body, and errors committed in Dyet, and sweating it seemed to change into a continual; for in whom the fits were not rightly concluded nor ended in a remission, by reason of the morbid matter not being thoroughly dispersed, their Blood was continually hot, from whence in came to pass, that the fits sooner returned, and continued longer; till at length, by reason of the plenty of matter and the languishment of Nature, the Blood being made weaker endeavoured no longer to swell up and to sepearate the feaverish matter, at set hours, but to subdue it by little and little, with a continual effervency.

We are to inquire concerning the causes of this Disease, what may be the leading, evident and conjunct cause, by the means of which is spread so generally, and became Epidemical through all *England*; by what means, and for what occasion, it was wont to be excited in all men; and lastly; what kind of alteration of the Blood and humors, being induced brought forth this kind of Feaver, with such a provision of symptoms, and conserved it in the Act.

I know it is easie to place wholly the cause of this so popular Disease in the malignant constitution of the Air, to wit, that the particles of the Aire which we breath, were infected by a certain extraneous Infection and not agreeable to our Nature, the little bodies of which Infections being admitted within, did ferment with the Blood and humors, and so in most, brought in this Feaver, almost with the same appearance of symptoms. For who dares deduce the Original of a Disease so generally raging from a less publick fountain? Or refer to any other place, the received causes of Diseases, than to that nest of Vital Air, on which every one feeds? But whilst I more attentively consider the thing, it seems to me, that its stem, and as it were its first beginnings, are to be sought a little deeper. To wit, that this Feaver is born not from the Contagion communicated by the Air, and immediately fixing its evil on men, but rather from a certain feaverish predisposition or nature, impressed somewhat before on our Bodies, because of the intemperance of the Year, which at length having gotten maturity, on the least occasion is brought into Act, and so breaks not forth into this Feaver, so much as it sifts it forth.

For when upon the Calends of *July*, the Air was immoderately hot, with a most intense heat for many days, it easily altered our Blood towards an hot and bilous intemperance, by which (as in wine growing more hot than it should do) the sweet part and the spirituous was much consumed, in the mean time, the Saline and the Sulphureous was too much carried forth, that by that means, the liquor easily contracted a rancor or sourness: We have in another place shewn, that this kind of disposition of the Blood, whereby indeed it turns from a sweet and spirituous temper, into a boylous or cholerick, is most apt for an intermitting Feavers: Hence the alible juice, which is continually carried into the mass of Blood, is not rightly concocted, nor assimilated into Blood, but perverted as it were into extraneous and fermentative matter; which arising to a fulness in the bosom of the Blood it self, and growing turgid according to its increase at set periods, as we have already shewn, induces

the fits of the intermitting Feaver: when therefore, from the great burning heat of this Summer, the Blood almost of all men, becoming more hot than usual, was very much scorched, it is no wonder, if from thence it should contract a great aptitude for intermitting Feavers. But why not whilst the fervor of the Heaven was yet urgent, but a little after, this Disease spread it self, the reason is, because this indisposition is not impressed on our Blood at once or at one time, but by little and little, and not but of along time; and therefore Diseases like Fruits, are chiefly ripened in Autumn, after the foregoing heat of the Summer.

This aptitude or feaverish disposition, all do not contract alike; those whose Blood is of a more hot Nature, and abounds more in Sulphur, and for that cause is sooner scorched, also such who labour, or stay long in the heat of the Sun, and open Air, by reason of their Blood being more remarkably torried, more easily fell into this Disease; wherefore, at first, it chiefly raged among Husbandmen in the Country: of these, who had required an aptitude to this Feaver, from the Blood being before scorched, some perhaps fell into this of their own accord, the feaverish disposition being leisurely carried forth to a maturity; others by reason of a light occasion or evident cause, which was wont otherways to stir up the feaverish burning, as from taking Cold, Surfeit, drinking of Wine, and the like; and others fell sick from the Contagion received of others, for as the *effluvia* constantly came away from the sick, when they peirced Bodies predisposed to the like distemper they easily excited the hid powers into Act.

As to the third Proposition, to wit, that the conjunct cause of this Disease, and its formal Reason, may be known, we must put you in mind of those things, which we have elsewhere delivered concerning the nature of intermitting Feavers, for we suppose the torrid and bizonous constitution of the Blood, as the basis of this Disease, by reason of which the alible juice being supplied daily, as it were in a certain measure, is not rightly concocted, but by the afflation or scorching, becomes or goes into a fermentative matter, not miscible with the Blood. When the Blood is filled to a fulness with this matter (which happens at set intervals of times, because the alible juice is supplied as it were by a set measure) it of its own accord conceives a swelling up, and the growing hot or effervescency being excited, for the carrying away of this matter, causes the feaverish fit: which so long indures till this feaverish matter being inkindled, and as it were burnt in the heart, is wholly dissipated with sweat.

From these things premised, it is made plain, that in this distemper, we now discourse of, there are some things happen by a peculiar way, from the common kind of intermitting Feavers, and therefore it was noted, that not undeservedly, with the appellation of a new Feaver; which are, First, that about the beginning of the Disease, fits did a long while afflict the sick, without cold or shaking, but with a most intense heat, thirst, and cruel vomiting; by which, the sweat hardly, and for the most part partial, and often interrupted, succeeded, whereby the fit was not finished but of a long time. The reason of which, may be only laid upon the very choleric disposition of the Blood, and being above measure scorched: For this proceeding from the domineering Sulphur, wholly inhibits the wonted sourness of the Blood, which follows its turgency or swelling up, and is wont to stir up the cold or shivering; and by reason of this kind of temper of Blood, too much roasting and as it were burning the alible juice, the Blood growing turgid, together with that juice, and being stirred up into motion, is inkindled more then it was wont in the heart, and by its deflagration, induces a most intense and troublsome heat, with thirst, to the sick. Choleric vomitings, happen not only at the beginning but in the middle of the fit, by reason of the abundance of choler, with which, the Choleduct Vessels being too much filled infuse the intestines; which then a Convulsion being stirred up, is easily emptied into the Ventricle: Sweat hardly succeeds, because the bile abounds more than the serum, wherefore the Feavourish matter being burnt, it is not easily sifted forth by sweat, but being either mingled with the Blood, causes the long effervency, or being carried towards the intestines, produces vomiting or a Flux. Secondly, This Feavour differs from the vulgar intermitting Feavour, because after the fit was ended, there was no full intermission, even to a remission, but the sick still remained languishing and thirsty; and as to appetite, sleep, and other accidents, very ill: which indeed happened, because, by the intense heat of the fit, more of the Blood and feaverish matter is inkindled, than that its recrements remaining after its deflagration, are able presently to be dissipated, especially, because the sweat, by reason of the dryness of the matter, very hardly succeeds, nor is the Feaverish matter enough diluted with the serous *Latex*, to be sifted forth; wherefore, the Blood by its Contagion in the time of the fit, not being perfectly freed, grows hot still, neither the fit being ended, doth it get any full truce from the disease: In the mean time, whilst the Blood is urged after this manner, with almost a continual effervency, it differs from a Synochus; because in this, the Sulphureous part of the blood, being too much carried forth, and as it were inflamed, causes the Feaver by its deflagration; but the continual ebullition, which

which after this manner comes upon this intermitting Feaver, wholly depends upon the confusion of the not miscible matter, and its hard secretion from the Blood. The Synochus happens like Wine growing hot of its own accord, by reason of its richness, the other conceives its fury, like the same Wine, by reason of some heterogeneous thing powred to it: wherefore we remark, that whilst our Feaver is seen still to be continual, it is not cured by Sweat or the Flux of the Belly, altho they frequently and copiously happen; because it depending upon the Blood being depauperated, rather than being inflamed, it continues long, and disposes the sick towards a Cachexie.

3. There is a third reason of difference, by which this Feaver may be distinguished from the common rank of intermitting Feavers, and it is this, that it is easily propagated to others by contagion; the reason of which is, because here very many Bodies are predisposed after the same manner, towards the same Distemper, which happens not at another time; wherefore, the meer Effluvia's from a diseased Body, are able to excite the like effect, in a very fit subject; even as some beams of Flame enkindle Flame, in a very combustible matter: In the mean time all do not alike contract the Infection of this Feaver, but that some being less prepared or fitted for it, converse with the sick without harm.

4. There is another Symptom occurs, not constant to this Feaver, but only hapning in some places, that discriminates it not only from the common, but varies its own proper type; to wit, sometimes it happens, this Disease to be accompanied with a Dysenterick Distemper; in some Cholerick Vomits, and Bilous Stools very much infect; and in others Bloody Stools follow, with cruel pains and torments of the Belly. The former I often observed in our Neighbourhood, and the reason of it may be deduced from the highest bilous temper of the Blood: For by reason of this, the adust matter, not to be dissipated by Sweat, is copiously sifted into the Liver; then by reason of the Choler-carrying Vessels, being filled to a flowing over, it is sent away to the Ventricle and Intestines. The other Dysenterical Distemper was found only in some places, and there peculiar rather than common, it laid hold only of some sick. The Origine of it may be referred to the peculiar dispositions of some Bodies, or vicious provision, also to the site of the place, or condition of the Air; then the Disease is to be suspected, to be thence translated to others, not without the communication of a certain infection.

There is to be had a double Prognostication concerning this Disease: First, of the Feaver in General, what end it shall have, when, what it may threaten to the Land: whether it precede not (which is commonly feared) the Plague, or Pestilential Sickneses. Secondly, The signs ought to be laid down, whereby we are wont to presage health, or danger, in the various cases of the sick.

As to the first, Because we have shown that the Origine of this distemper is not to be fetched from the Contagion of the Air, or its being infected with any venomous Infection, nor from any malignant seeds of Vapours diffused through the Air, but only from the signal bilous temper or disposition of our Bodies, with the Blood being made adust and roasted extreemly, by reason of the Summer heats, I think there is no reason of fear, that this Feaver should be carried forth into any thing worse by the vice of the Air, or might at length grow to be Malignant or Pestilential. But rather (that the season of the Year being changed, and the alteration of our Blood assuredly to be expected) we might fear lest this Feaver, which now imitates the way of an intermitting Feaver, should afterwards pass into a Quartan, the Blood growing into a melancholy temper. Which thing indeed I observed to happen to some already, and I believe, that before the Autumn be fully passed over, will happen to many more.

As to the particular Prognostication, the chiefly notable signs, which occur in the course of this Feaver, and in a manner foretel its condition and event, are of this sort; if the Disease happens in a firm Body, well tempered, and easily perspirable; if vomiting with ease succeeds, and that the Belly be loose: if the fit begins with a light shivering, and afterwards a moderate heat, with sweat concludes it, and that the intermission be with some tolerable remission; if the Pulse be strong, the Urine of a flame colour, clear, and with a laudable hypostasis, we may Predict that the Disease will quickly end without any danger. But if this Feaver be excited in a fat Body, and of a vicious habit, if with troublesome vomiting, an intolerable thirst, and fierce heat, long exercise the sick; if to the heat a difficult sweat, and partial, and often interrupted, and between frequent vomitings succeed, and that it ends not in a remission, we may declare, that this Disease may belong, and of a dangerous issue. But if the sick remain in strength, and the Urine shew signs of concoction, we need not despair of health; especially, if after four or five periods, the Disease, as it is wont to do, remits of its wonted fierceness. Thirdly we observe, if this Disease is excited in an old Body, or others broken with sicknesses, or debilitated; if besides horrid vomitings, there happen swoonings, faintings, Deliriums or Lethargic distempers; if after many fits, the sick having lost their strength, the Disease remits nothing, but exerciseth the Blood, with a continual effervency, and that the Vital Spirits are much destroyed; if the appetite be lost, wakings pertinacious, and that they have

have Convulsive motions, with a weak Pulse, and Urine troubled, or thick, we judge the matter to be full of danger: yet is not the sick to be left as desperate, because the Disease is not hasty, and kills not suddenly, and out of hand; but is drawn out at length, and grants time and occasions to nature, of recollecting her self, and to the Physician, of giving Remedies.

The Therapeutic Indications, which have place in the Cure of this Feaver, are chiefly four. First, That the Blood being now scorched, and made too choleric, may be reduced to its due temper. Secondly, That the depravation of the nourishable juice, and its alteration into a fermentative matter, may be inhibited, or at least lessened. Thirdly, That about the declining of the Disease, the Blood depauperated by a frequent deflagration, and made more impure by the fusion or pouring into it the morbidic or adult matter, may be restored, and rendered as it should be volatile. Fourthly, That the symptoms, which chiefly infest in the course of the Disease, may be timely helped by fit Remedies; that these intentions may be satisfied, I counsel that this following method be used.

About the beginning of the Disease, if the bilious or choleric humor, flowing forth of the choler-bearing Vessels, and being suffused into the Ventricle, cause the sick to be prone to vomiting, let a more plentiful evacuation be procured, by a gentle Emetic in the time of the fit: The opening of a Vein, and Purging, ought not to be administered, unless between the fits: for whilst the Blood grows mainly hot, or is resolved into sweat, Nature ought not to be called back from the Work begun, nor her endeavours to be disturbed, by the prescriptions of Physicians; wherefore, after the fit being past, and the sweat thoroughly finished, a Purging may be instituted, by a gentle Cathartic, and the same afterwards sometimes repeated, on the like occasion: for by this method, not only the provision of the excrementitious matter, is brought away, from the first passages, but chiefly the choler-bearing Vessels being emptied, the choler is copiously drawn forth from the mass of Blood, and by that means the Blood is restored to its natural Crasis or disposition. The letting of Blood, if it be indicated, should be performed presently after the beginning; for so its Liquor being too turgent or swelling up, is eventilated, whereby both the nutritious juice is less perverted, and the fit urging, it burns forth with a less heat, together with the morbidic matter: but otherwise, if a Vein be opened after a long sickness, when the Blood being made poorer, and more watry, more of the morbidic matter is heaped together, and does not rightly concoct, and sift it forth, it detracts much from the strength of Nitre, and nothing from the power of the Disease. In the interval of the fits, when there is no place for opening a Vein, nor Purging, let the Belly be kept loose, by the constant use of Clysters; also digestive Remedies, of acetous or saline Liquors and Powders, are to be exhibited; of which sort are Cream of Tartar, fixed Salts of Herbs, Tartar Vitriolate, Harts-horn burnt, Spirit of Vitriol, and Salt, &c. for these restore the lost or sleepy ferments of the Viscera, purify the Blood by fusing it, also separate the morbidic matter, and as it were precipitate it: also, at this time between, if pertinacious waking infest the sick, and overthrow their strength, it may be lawful to administer anodyne, and gentle narcotic Remedies; but never in the fit: for then they greatly hinder the subduing, and sifting forth of the feaverish matter, and draw out in length the fit that would end sooner.

These things are to be done about the interstitia, or intervals of the fits; but whilst the fit is urgent, altho' the sick then chiefly send for, and call upon Physicians, yet at this time their Prescripts are limited to a narrower space: If Vomiting (notwithstanding an Emetic being given) still infest, it may be more freely provoked, either by simple Posset Drink, or with bitter Herbs boiled in it: But let the chiefest means of help be, in temperating the heat and thirst, which most grievously torments the sick in this Feaver: For whilst the Blood growing hot, with the morbidic matter, and being inkindled in the Heart, leaps forth into the Lungs, stirs up there a cruel Inflammation, which requires a profusion of a cold humor, as it were for the extinguishing the Flame; wherefore they greedily desire without any measure drink, for want of which the sick are almost killed with too great heat, and their Blood being almost wholly rarified into flame and fume, the thrud of Circulation is hardly continued; wherefore, drink ought to be wholly granted, to those in Feavers: which however, if it be taken in too large a quantity, it at first more disturbs the estuating Blood, and at length brings confusion to the feaverish matter, begun to be separated; that from thence, the Work of subaction and secretion is longer protracted, and the fit is made longer: also, besides, large drinking causes troubles in the Ventricle, and by disturbing it, and often provoking Vomiting, hinders the breathing forth, and calls inward the sweat breaking forth, or perhaps already broke forth: wherefore, at first, the heat of the Feaver being inkindled, altho' the sick be very thirsty, let them only sip a little, and abstain from drink as much as they can; afterwards, when the matter being burnt, and subdued, begins to be dissipated by sweat, they may be more freely indulged as to this, for so the sweating is greatly helped, and the fit is sooner finished: as to the nature of the Drink, let them take sometimes Posset Drink, sometimes Small Beer,

Beer, or Barly-Water, and sometimes simple Water, or sharpned with the Juice of Limons: In this case, the use of *Sal prunellæ* is deservedly praised, to be given in every Liquor; for this, with its nitrosity, wonderfully allays the raging Blood, and potently moves Sweats: I have often observed, in the midst of a Fit, the sick wont to fall into a Swoon, or Syncopy, to whom presently they give Cordials or hot Waters, that much increase the violence of the Feaver, and bring forth more troubles than usual, that the Fit is more difficultly finished; but these faintings, for the most part, happen, either from a bilious humor suffused in the Ventricle, or by reason of the sweat suddenly breaking forth; and against these, I always found the most present Remedy, that either a feather being put down the throat, Vomiting may be provok'd, or that Liquor being plentifully drunk, a sweat may be again raised up; also in the whole course of this Feaver, I am wont never to give any Cordials, or Alexiteriums.

The Diet in this Feaver ought to be only slender, and not nourishing, all sorts of Flesh, or any prepared of them, are wholly to be avoided; for as these abound with Sulphur, they give a more plentiful food (as Oyl poured on Flame) to the hot or enkindled Blood: Besides, nothing spirituous, as strong Waters, strong Beer, or Wine, is to be yielded to; but Decoctions, or Broths of Oatmeal, or Barly, altered with cooling Herbs, are chiefly to be used; also Posset-Drink, and Small Beer, or Whey, is to be given them at their pleasure: for by this means, when a very slender and watry nourishing Juice is conveyed to the mass of Blood, the soluted Particles of Sulphur, burn forth sooner, and with the less tumult; also the Recrements of the adust matter are more easily carried from the bosom of the Blood; but if on the contrary, a more rich or plentiful Nourishment be administred, the effervescency of the Blood is thereby very much augmented, and the Blood is more infected, by the confusion or pouring in of the adust matter.

After that the Blood being much burnt forth by frequent fits, and the Feaver being in its declination, remits of its fervor and fierceness, you must take heed, lest the sick at length growing well, fall not into a Cachexy, or Scorbutic Distemper; for the disposition of the Viscera being hurt, and the Blood being much depauperated, the alible Juice, though not scorched so as at first, is not however rightly concocted, and ripened into perfect Blood; but by reason of the want of Transpiration, the serous Excrements being imbued with a fixed Salt, are greatly heaped together, and now fixed in the Bowels, now in the extreme Parts, bring forth various Distempers. Wherefore in a long languishing of the sick, or otherwise for the sake of being sooner well, Remedies should be given them, which volatilize the Blood, or hinder the stuffings of the Viscera, or if stuffed, may open them, and their ferments as if extinct, restore: for this use, those Remedies and Preparations chiefly help, which are commonly called Digestives and Antiscorbuticks; with which, being timely administred, I have known very many weak, pale, and as it were without Blood, suddenly to recover a Liveliness and Vigor.

The Description of a Catarrhal Feaver Epidemical in the middle of the Spring, in the Year 1658. taken the fourth of June.

AN equally intense Frost followed the next Winter, the immoderate heat of the foregoing Summer, so that no one living could remember such a Year, for either excess both of heat and cold. From the Ides of December, almost to the Vernal Equinox, the Earth was covered with Snow, and the North-Wind constantly blowing, all things without doors were frozen: Also, afterwards, from the beginning of the Spring, almost to the beginning of June, the same Wind still blowing, the Season was more like Winter than Spring, unless now and then a hot day came between. During the Winter (unless that a Quartan Feaver contracted in Autumn, infected some) among our Countrymen, there was a moderate state of Health, and freedom from all popular Diseases. The Spring coming on, an intermitting Tertian (as used to do every year before) fell upon some. About the end of April, suddenly a Distemper arose, as if sent by some Blast of the Stars, which laid hold on very many together; that in some Towns, in the space of a Week, above a thousand People fell sick together. The particular symptom of this Disease, and which first invaded the sick, was a troublesome Cough, with great spitting, also a Catarrh falling down on the Palat, Throat and Nostrils; also it was accompanied with a feaverish Distemper, joyned with heat and thirst, want of appetite, a spontaneous weariness, and a grievous pain in the Back and Limbs; which Feaver however was more remiss in some, that they could go abroad, and follow their Affairs in the time of their sickness, but complaining in the mean time, of want of strength, and of languishing, a loathing of Food, a Cough, and a Catarrh: But in some a very hot Distemper plainly appeared, that being thrown into Bed, they were troubled with burning, thirst, waking, hoarseness, and coughing, almost continual; sometimes there came upon this a Bleeding at Nose, and in some a bloody Spittle, and frequently a bloody Flux; such as were

were indued with an infirm Body, or men of a more declining Age, that were taken with this Disease, not a few died of it; but the more strong, and almost all of an healthful constitution recovered; those who falling sick of this Disease, and died, for the most part died by reason of the strength being leisurely wasted, and a serous heap more and more gathered together in the Breast, with the Feaver being increased, and a difficulty of Breath, like those sick of an Hætic Feaver. Concerning this Disease, we are to enquire, what procatartic cause it had, that it should arise in the middle of the Spring suddenly, and that the third part of Mankind almost should be distempered with the same in the space of a Month; then the signs and symptoms being carefully collated, the formal reason of this Disease, also its Crisis and Way of Cure ought to be assigned.

That the Northern Wind is most apt to produce Catarrhs, besides the Testimony of *Hippocrates*, common Experience doth make known: But why Catarrhs did not spread, at least in some peculiar places, all the Winter and Spring, but only in one Months space, and then joyned with a Feaver; this Distemper should become Epidemical, doth not so plainly appear. I know many deduce the Cause from the unequal Temper of the Air at that time; which although for the most part very cold, yet the North-Wind sometimes lessening, there would be a day or two very hot between: wherefore from this occasion, as from cold taken after the heat, men should commonly fall sick: But indeed, for the exciting the Distemper, so suddenly rising, and commonly spreading, there is required, besides such an occasion, a great foregoing Cause or Predisposition, though the other might suffice perhaps, for an evident cause, for to distemper them with this Sickness; for we ought to suppose, that almost all men were prone to the receiving this Disease, otherwise no evident cause could have exercised its power so potently on so many; wherefore, it seems very likely, that this Disease had its Origine from the intemperance and great inordination of the Year: and as the Autumnal intermitting Feaver before described, was the product of the preceding immoderate heat, so this Catarrhal Feaver depended altogether upon the following part of the Year, being so extremely cold; for the Blood being now thoroughly roasted, by the very hot Summer, and prone to the Feaver before described, then being made more sowerish by the Autumn urging it, and apt for a Quartan Feaver, afterwards being a little eventilated by reason of the strong Cold of the Winter, and hindered from its due perspiration, retained yet its Dyscrasie, or evil Disposition, and readily broke forth on the first occasion given: wherefore, when the Blood, in the middle of the Spring (as the Juice of Vegetables) being made more lively, and also begun to flower, and grow rank, by reason of the stoppage being still continued, was straitened in its Circulation, and easily made prone to a feaverish effervescency: and as the serous Water redounding in the Blood, could not evaporate outwardly, because of the Pores being still straitened by the cold, restagnating within, and chiefly falling upon the Lungs (where it might be moved about, instead of an outward breathing forth) excited the so frequent and troublesome Cough.

The Original therefore, and formal Reason of this Disease, are founded chiefly on two things, to wit, that there together hapned a greater effervescency of the Blood than usual, from the coming on of the Spring-Season, and also a Stoppage, or great constriction of the Pores, excited by the too great Cold of the foregoing Season; that therefore there was not a free space granted to the Blood, flowing or luxuriating in the Vessels: the business being after the same manner, as if Wine begun to grow hot, should be put up into close shut Vessels; for by this means, either the Vessels, or the Liquor were in danger to be lost.

Wherefore, that we may contract the thing in short, the cause that this Disease begun in the middle of the Spring, having presently spread largely, seized very many, was not the blast of a malignant Air, whereby the sick were distempered, as if struck with a blasting, but that at this time, the Blood being inspired by the constitution of the Spring, and so luxuriating, and apt to grow hot, was contracted or straitened in its motion, and the effluvia's being constrained inwardly, could not be sufficiently eventilated or cooled. In every year, tho temperate, it is usual in the Spring and Autumn for some Epidemical Diseases to reign, because at this time, the Blood being as it were restored, flowers anew; and therefore, intermitting Feavers, and sometimes the Small Pox ordinarily spread in this Season; wherefore, 'tis no wonder, after a great unequal constitution of the Year, and not natural, when in this Spring, the Blood boiling up more lively within the Vessels, by reason of transpiration being hindered, could not be freely circulated, and sufficiently eventilated, if for that cause, great disorders follow, and from this most common cause, a Distemper greatly Epidemical should be excited.

As to the Symptoms joyned with this Disease, a feaverish intemperature, and whatsoever belongs to this, the heat of the *Præcordia*, thirst, a spontaneous weariness, pain in the Head, Loyns, and Limbs, were induced from the Blood growing hot, and not sufficiently eventilated; hence in many, a part of the thinner Blood being heated, and the rest of the Liquor being only driven into confusion, a simple Synochus, or of more days was induced, and this

for the most part ceased within a few days: But in some endued with a vicious disposition of Blood, or evil habit of Body, this kind of Feaver arising by reason of the same cause, quickly passed into a very dangerous Putrid Feaver, and often Mortal.

The Cough accompanying this feaver with a Catarrh, draws its Origine from a serous humour heaped up together in the Blood, by reason of transpiration being hindred for a long time, and then an effervescency being risen, dropping forth more from the little Arteries, gaping within; for when the Pores are constrained, the superfluous serosities in the Blood, being wont to evaporate outwardly, are poured forth on the Lungs, by a proper castration or cleansing of the blood, wherefore, by taking cold (as they commonly term it) that is, from transpiration outwardly being hindred, the Cough for the most part is stirred up: And for a foregoing cause to this Distemper, the flowing forth of the serum into the Mass of Blood, hath for the most part the chief place; for, from the long cold hindring the scorching of the blood, or the provision of the Bile, and prohibiting the breathing forth of the watry humor, there was a necessity, that very much of the serous Humor should be heaped up in the Blood: wherefore, when the Blood flowing in the Spring, conceived a heat, the flowing forth of the Serum, and a pouring of it on the interior parts, was wont to cause first the Cough, as the proper symptom of this Disease; and those, whose Blood was more diluted by the mixtion of the Serum, and who were greatly obnoxious to the Cough, and a Rheumatic Distemper, were cured with less trouble of the feaverish Distemper. The Prognostick of this Disease, concerning private persons, is for the most part easie, that one may deliver the event, from the first assault; for if this sickness be excited in a strong body, and healthful before, and that the feaverish Distemper be moderate, and without any grievous and horrid symptom, the business is free from danger, and the Distemper is to be accounted but of light moment; as that commonly is of catching Cold, neither needs a Physician be consulted, nor Remedies, unless trivial and ordinary, be administered: But if this Distemper happens in a weak and sickly Body, with an evil provision, or that the Feaver being carried into putrid Feaver, or the Cough growing grievous, induces difficult breathing, and as it were a tabid or consumptive disposition, the event of the Disease is much to be suspected, and often terminates in Death. The common Prognostic that was taken from hence, concerning the future state of the Year, contains nothing to be feared, or omimates any great ill; by reason of the unequal intemperance of the Year, the great heats, and then excessive cold, we might fear Diseases to arise from the Dyscrasie of the Blood, yet from the present condition, we need neither suspect any noted depravation of the Air, or Infection with poysonous breaths; that from thence may be had any Judgment of the Plague, or Malignant Disease to be at hand.

As to what belongs to the Cure, when this Disease is more lightly inflicted, its Cure for the most part is left to Nature; for this Feaver, when it is only a simple Synochus, is wont to be cured within a few days by sweat: wherefore, by a copious sweating, for the most part about the third or fourth day, the heat and thirst, the weariness; and heavy pains are allay'd; then the Cough being somewhat longer protracted, by little and little afterwards remits, and at length the sick leisurely grow well; if this Disease hath rooted it self more deeply, there is need of fit Remedies, and an exact method of curing; the Feaver growing worse is to be healed, according to the Rules to be observed in a Putrid Feaver; but nevertheless with this difference, that, because transpiration being hindered, and the suffusion of the serous humour on the Lungs, are chiefly in fault, therefore Diaphretic Remedies, and those called Pectoral, are of more frequent use; for these restrain the flowing forth of the Serum from the Vessels within, or by opening the Pores, convey it forth of doors; or precipitating it from the bosom of the Blood, send it forth by the Urinary Passages; therefore the Method of Medecine for this Disease, being brought into the worser state, respects both the feaverish intemperance, for the sake of curing which, you are to be directed, according to the intentions shewn in the Putrid Feaver, and also the Rheumatic Distemper, which however let it be secondary, and not every expectorating Remedy; or those used against a Cough, are to be admitted, but of that kind only which do not increase the Feaver: the forms of these, and the means of curing, are to be sought from the Precepts delivered generally for the Cure of the Putrid Feaver, and of the Cough; the Helps, which now by frequent experience, are commonly said to bring Cure chiefly in this Disease, are sweating, or the provoking of Sweat, and letting of Blood; for the Vessels being emptied by this or that means, both the immoderate heat of the Blood, and the abundance of the Serum are restrained.

A Description of an Epidemical Feaver arising about the beginning of Autumn, 1658. taken the 13th. of September.

THE Vernal Feaver but now described, did not last longer than six weeks, that it plainly was seen, that it was only a more light flowing of the Blood, which swelling up in the Spring, and at the same time streightned in space, for want of ventilation, most impetuously boyled.

boyled up, like new Wine close shut up in bottles, and then ceased of itself. Yet from thence, as neither the year, so neither our blood did recover its due temperature, and so another Tinder or Nest for a new Feaver, was quickly gathered together: because after the Summer Solstice, the North wind still blowing, a cold season remained for a long while; so that the Fruit and Corn this year, was feared by the Husbandmen, would scarce be thoroughly ripened; but after this, a little before the beginning of *July*, a most fierce heat followed, for several days; and when the Dog-days were begun, the Air grew most cruelly hot, that one could scarce endure the open Air. By reason of this Heat and Cold in excess, the temperature of this Year was very unequal: wherefore, there was a necessity for our Blood to be now fixed, and as it were congealed, now too much roasted, and so perverted from its natural disposition, to a scorched and Melancholy Temper; also it came to pass that the Pores of the skin were much altered from their right constitution, that by that means, an insensible transpiration could not be performed after the wonted manner.

From the time that the former Feaver ceased, almost to the end of the Dog-days, there was a state of Health, and free from all Popular Diseases; but then a few here and there among the Villages, and in lesser places, first fell sick; but afterwards, about the end of *August*, a new Feaver suddenly arising, began to spread through whole Regions, every where round about us; also this, as the other which spread the last Autumn, raged chiefly in Country Houses and Villages; but in the mean time, few of the Inhabitants of the greater Towns and Cities fell sick. At the same time, in other Regions, situate at a distance from us, almost throughout *England*, the Epidemical Feaver was said to rage; and in some other places, to be far more deadly than it was about our Country. Perhaps the Idea of this Feaver now reigning had not the provision of its Symptoms alike in all places, or was noted wholly with the same Appearances and Accidents: yet whatever it shewed in our parts, as to its Nature, I shall briefly and succinctly add, from our own proper observation, or what I had learnt, being communicated from others.

About the beginning of this Disease, its figure was wandering, and very uncertain; because in some there was a continual fervor, in others it was intermitting, being renewed by set fits; but at this time it happened to very many, as a pathognomic Symptom, that they were ill in their Brain and Nervous Stock, that presently from the very beginning of this Feaver, almost all complained of their Head being grievously distempered; For a cruel Head-ach infested some, and hardness of hearing, with a noise in the Ears troubled others, but to most was wont to happen, either a stupidity, and heavy sleepiness, with a vertiginous Distemper, or pertinacious wakings, with a Delirium, and distractions of the Animal Spirits. I have observed in some, that on the first or second day of their Sickness, that little broad and red spots, like to the Measles, have leisurely broke forth in the whole Body, which being shortly vanished, the Feaver presently became stronger, and especially the Distempers of the Head, far more grievous. From thence a benumbedness of the Senses, and a Sleepiness fell upon some for many days, that they lay a long while as if dying, without speaking, or knowledge of their Friends. I knew others to have fallen from hence into a Lethargy, and others cast into an Apoplexy, and some into a Phrensie and Delirium. Of these the younger and strong men (yet not without a long languishment, and doubtful recovery) most of them escaped; in the mean time, old men, or other ways weak and sickly, generally died. Those who fell sick with the Feaver, as it were continual, with those notes of malignity, were more rare, and the distempered were only sporadically, in some Houses only. But the Sickness which most commonly spread about us, fell upon most, and tho it cruelly raged, it seemed to imitate an intermitting Feaver, to wit either a Tertian, or a Quotidian; for that the sick had fits, either every day, or (which I more often observed) every other day, which infested them grievously, and a long while, with Cold, Heat and Sweat, succeeding in order: but these kind of fits, as also the course of the whole Disease, were wont to be noted with diversity, according to the Age and Temper of the Sick, and with various concurrence of Symptoms and Accidents. Yet this was common to most of (I had like to have said all) the sick, that together with the Feaver, they were troubled with Cephalic Distempers.

When therefore any one was troubled with this Disease (whether the Sickness was excited from an evident Cause or Contagion, or without any manifest occasion) its coming betrayed it self by a Pain in the Head, and often in the Loyns, with Thirst, Want of Appetite, spontaneous Weariness, and Heat tho not strong: If it hapned in a young Body of a florid Blood, and more hot temper, the Fits wanted the Cold and Shivering, about its beginning, but they were very troublesome and sharp, with long heat: The sick were often troubled with Vomiting, and their Head aaked cruelly for the most part, Sweat difficultly succeeded, which being often partial and quickly broke off, rarely cured the Fit, but when the Sweat failed, they grew hot again, that scarce in eighteen or twenty four hours the Fit was finished in some. In the mean time, from the Blood being very fervent, the Phantasie was disturbed, that oftentimes a Delirium, absurd or idle Talking, Wakings, and high Inquietudes were stirred up during the Fit;

but the same being finished, in the time between, still a troublesome Thirst, a slow Heat, Languor of Spirits, and great Debility of strength, with an Head-Ach, and a vertiginous Distemper, for the most part molested them. It was rarely found, for any to find themselves indifferently well, as in a common Tertian, between the Fits. About the beginning of the Disease, the feaverish Fiercenesses were somewhat more mild, which afterwards at every turn, leisurely grew worse, and then began with Cold and Shaking; to which nevertheless, after a long and very troublesome heat, Sweat very hardly succeeded in most, so that the Fit rarely ended in its due temper. Within six or seven Periods, the strength of the Sick was much cast down, that being made languid and weak, they had an hard task to struggle with the Disease; because unless Nature were succoured by Art, the Feaver still prevailed, and rarely or never in a short time, was it cured by a Crisis, or leisurely remitted; but it brought the sick into great streights, by its long siege, and still persisting, till the Blood being by its frequent deflagration made very lifeless and watery, was unable to grow too hot in the Vessels of its own accord, or to be enkindled more plentifully in the Heart, and then oftentimes became so dead, and wanting of Spirits, that being insufficient for the continuing the Vital Lamp, it brought in Death. But sometimes the Mass of Blood being depraved, and made poor by this Disease, was able (tho hardly) to continue the half extinct Vital Fire, and to renew it by little and little, with Spirit and Vigor, in a long time; yet in the mean time, after the height of this Disease, when the blood being made more weak and impure, could not expel forth of doors this feaverish Matter, or adust recrements, by a critical motion, it often transferred it to the Brain; and therefore about the height of this Feaver, a torpor, and stupidity of Spirits, Sleepiness, Vertigo, Tingling of the Ears, Tremblings, and convulsive motions, with a great oppression of the whole Animal Faculty, were most often induced.

Men of a cold temperament, or in years, who were taken with this Disease, altho they were but little feaverish, were wont however to be in greater danger of Life; because, in these, besides the disposition of the blood, not easily reducible; also what was gathered together in the fits, that was extraneous and not to be mixed, was hardly subdued, and difficultly sifted forth of the Mass of blood; wherefore, both the blood was still more notably depraved in its Crisis, and in every Fit more infected by the impure mixture: Moreover, the nervous Liquor was greatly perverted from its due temper, and defiled most badly, by the adust recrements continually poured on the Brain. Therefore, when old men, melancholic, or otherwise sickly persons, fell into this Feaver, they became, presently after its first Assault, stupified, and for the most part vertiginous: Tho in the Fits, the heat was not very sharp and piercing, they were however very unquiet, and still tossing about, oftentimes they talked idly and at random; after a long burning, either no Sweat, or only partial, and often broke off, followed; whereby the Fit was not fully helped, but that in the whole intervals, the sick were thirsty, and remained very ill, with a dryness of the Mouth, a scurfiness of the Tongue, and a suffusion of a viscous Filth. After some Fits, their strength being exceedingly cast down, they were wholly fixt to their Beds, or rise only for a little while, could scarce stand or set a foot before another, to move from place to place, or able to walk: in the mean time, they laboured with a languishment, a difficult breathing, a nummedness of senses, and a great debility of the whole nervous stock: The Urine in most was highly red, of a more deep colour, and of a thicker consistency, than in a common Tertian: The Pulse, whilst the strength was not wholly cast down, for the most part was strong and equal; afterwards. when the sick became very languishing, it was weak and unequal, and oftentimes intermitting; to which also, constriction of the Tendons, and convulsive Motions in the Wrists, being joyned, were for the most part Prognosticks of Death. Those who leisurely being debilitated, declined towards Death, some little time before they died, lay for the most part without speaking, or knowing those about them, as it were stupid; and it rarely hapned in this Feaver, that any one about to die, was so perfect in their Memory and Intellect, as to dispose of their Family-Affairs, or to take leave of their Friends. But it hapned to those that escaped, from a deep languishment and almost desperate condition, not quickly or suddenly to recover, from their manifest evil disposition, but lying a long while wavering, stupified, and without strength, that Nature at length, not but after a doubtful and difficult strife, got indeed scarcely the better of the Disease, and then recovered strength by degrees, and health lingeringly and slowly.

If the Nature, and formal Reason of this Epidemical Feaver but now described, be demanded, we say, that this (as that of the former year) properly is an intermitting Feaver: for what commonly spread bore that figure; altho some here and there, more rarely, had it continual, which we shall by the way mention by and by. The Seed-plot or Seminary of this, need not be derived from the Air, being infected with any Infection, but rather its leading Cause is to be sought, from the undue constitution of the Year, and from thence an indisposition of our Blood being acquired. Because, in the Spring and Autumn, intermitting Feavers have

have yearly sprung up and increased; to wit, for that our Blood, like to the Juice of Vegetables, is wont to be more lively moved than usual, and to flower at those times. Wherefore if the mass of Blood, by reason of the foregoing season, of the Summer or Winter, should be altered from its due temperature, and should contract either a sharp or atrabilous disposition, or of any other kind, its evil dispositions begun before, are chiefly ripened about the Equinoxes; to wit, when the Blood more freely fermenting (if that it hath departed from its natural disposition) doth not so easily sanguifie, but that it will be apt to pervert the alible juice, poured to it, into an extraneous and feaverish matter. When therefore this year had not very much declined from a right Constitution (as not only the Dog-days going before, but) that the two Solstices, and the Equinoxes, were wholly intemperate, it was no wonder if intermitting Feavers, more frequent than usual, and those noted with some unusual Symptoms, did encrease about the Autumn. That therefore an intermitting Epidemical Feaver raged at this time, I judge it not to be attributed to the fault of the present Air, but to the Irregularities of the foregoing season: yet from what Causes and Occasions, some Symptoms proper to this Feaver, and distinct from the common Rule of intermitting Feavers, did arise, will be worth our Enquiry. I have already said, that the provision, that made this Feaver so deadly, consisted in two things chiefly, *viz.* the temper of the Year, now extremely cold, then upon it very hot, then that it had variously perverted the disposition of our Blood, and had distempered the Pores of the Skin, with an undue Constitution. According to the Reasons taken from either, I shall endeavour to explicate the Accidents of this Disease, and to assign the Causes of its Appearance.

1. First, We shall observe, that the Type of this Feaver was various, to wit, in some with a continual heat, in others with an eruption of Spots, but in most intermitting, and like a Tertian, and sometimes (tho rarely) a Quotidian, repeating the Fits every day, or every other day: the Cause of this diversity, we impute to the more strong and potent morbid procacitax of this Year, which produced in the Autumn, a more common intermitting Feaver than it was wont; wherefore, in some (perhaps induced with a more praved habit of Body) it stirred up Feavers something malignant; and in whom it caused intermitting Feavers, according to the wonted manner of the Season, it made them to be noted with a peculiar appearance of Symptoms.

2. Those taken at this time with the Epidemical Feaver (whether it was Continual or intermitting) suffered presently evil Distempers of the Head, *viz.* now they were wont to be infested with cruel Head-Ach, now with a Stupor, or too great Distraction of the Animal Spirits. The reason of this is, that the nervous Juice, as well as the Blood, by reason of the intemperance of the Year, was much altered from its due Crasis or Disposition, *viz.* by nature sweet and spirituous, and was become now heavy, and almost lifeless, now sharp, and too much pungitive. Besides, also, the Mass it self of the Blood very much contributed to this Evil; for whilst it grew hot, the vaporous Effluvia, which ought to have been dispersed outwardly, by reason of the Pores being shut up, were poured upon the Brain, and Membranes of the Head; and by reason of this kind of stopping, impressed almost upon all, sweat hardly, and not but partial, and often interrupted, succeeded in the fits; hence also in the height of the Disease, a perfect Crisis, or spontaneous, rarely or never happened to cure it; but instead of this, if the business was committed to Nature, the adust Matter, or Recrements gathered together in the Blood, were transferred to the Head, and there raised up now the sleepy Evil, now Phrensies, and those long and stubborn.

3, That the Fits sometimes begun without cold or shivering, but with a troublesome heat, and were prolonged with a difficult Sweat, partial, and often interrupted; then forasmuch as the same being finished, the sick began again to wax hot, that the Fits were not finished without a long evaporation of a dry breath; the cause was, the too sharp and bilious disposition of the Blood, whereby when it grew turgid, it was stuffed rather with adust Salt and Sulphur, than a ferous Juice, and presently conceived an enkindling, without any previous Flux of nitrous Matter; and therefore for want of Serum, and by reason of the Pores being shut up, its desflagration was continued for a long time, almost only with a dry Exhalation, and scarce at last ended in a remission. And therefore the interstitia of the Fits were most troublesome with Heat and Thirst, Head-Ach, Vertigo, and other Distempers; because the feaverish Matter, being heaped up in the Blood, was not all dispersed by the several Fits, but part of it being left after the Fit, as it were extraneous and not miscible, induced almost a continual burning.

4. It was observed, that those distempered with this Feaver, presently lost their strength and flesh, that after a fit or two, they panted for breath, and being very weak, were not able to stand or go, without being led; when it is an usual thing in an intermitting Feaver that is common, for the Patient to be very lively and chearful between the Fits: the reason of the Difference is, because in this Feaver, the Mass of Blood is both
more

more depraved by the impure mixture of the degenerate Juice, and especially, that the same is more perverted from its natural disposition, and therefore, when it boils up less out of the fits, it yet ferments not rightly and equally in the bosom of the Heart: wherefore, when by any more quick motion, or agitation of the Body, the Blood is carried more impetuously into the bosom of the Heart, because it is not there presently enkindled, it both leaps forth of doors, and by its stagnation, causes the oppression of the Heart, and great weakning of the Vital Spirits. By reason of this kind of dyscrasie of the Blood, to wit, whereby it is made more unfit for due Fermentation and enkindling in the Heart, also some Beasts, and especially Horses, in the Spring-time, are made hard-breath'd, and very unapt to any rapid motion.

5. Lastly, We are to enquire, concerning this Feaver, wherefore it spread chiefly in Villages, in lesser Towns, and the Countrey, when Cities and greater Towns were less troubled with it. It might seem that this Distemper should be excited from Marshy Fogs, and other hurtful Vapors, plentifully heaped together in this or that Tract of the Air: but there is a better reason, for that the Inhabitants of these kind of places, being more exposed to the Spring-cold, and then to the Summer-heats, might have contracted a greater Dyscrasie of the Blood, and so a more apt disposition to this Feaver. For in truth, the Inhabitants of the Country could scarce go out of their houses, but they were exposed to the Sun's beams, or the fervor of the heated Air. Besides, Countrymen, Husbandmen, and such as were accustomed to Labors (among whom this Feaver chiefly raged) from their immoderate toil in the Sun or open Air, also using a bad and sharp Diet, sooner acquired an adust and torrid disposition of the blood, and so more apt for this Disease than Citizens and Townsmen, who lived an idle Life, and enjoyed wholesom food, and mostly continued within doors, and in refrigerating Shades. We may believe this Assertion, for that not only the Epidemical Feaver now raging, but also another of the Autumn before, excited by reason of the evil disposition of the blood increased chiefly among the Countrymen, and Inhabitants of the Countrey: but the popular Feaver, which arose in the middle of the Spring, depending chiefly upon transpiration being hindred, mostly infested Citizens and the Inhabitants of Towns; whilst Rustical men, that were wont, by Labour and Exercise, to procure a more free breathing forth, remained free.

The general Prognostication of this Disease seems only to ominate or foretel the like evil almost to follow this, as followed the Epidemical Feaver of the former Autumn, to wit, the Augury being taken rather from the intemperance of our Blood, than from the evil of the Air) not the Pest, but a Quartan Feaver might be feared to come upon it. As to the particular Indication, as Signs that promise Health or Death, I shall briefly mention them; and they chiefly respect the temper and government, either of the Blood, with the Vital Spirit, or else of the nervous Juice, with the Animal Spirit. If it be plainly indicated from the Pulse, Urine, from Actions less hurt, and the appearance of other Symptoms, that the Blood, as to its feaverish disposition, is not very much perverted from its natural temper; that in the fits it moderately burns forth; and in every Combat easily subdues the load of the feaverish matter, and wholly shakes it off from its company; that after some fits, the mass of Blood is somewhat restored towards its due Temper; that it perverts little the alible Juice, and sifts forth, with a more gentle rising up, what is extraneous and not mingleable, and that if in the mean time, the other spirituous Liquor, rightly inspires and waters the Brain and Nervous Bodies, that Sleep, Waking, Sensation and Motion are performed well, or at least indifferently, all good is to be hoped concerning the sick. But if it appears from the same Fountains of Indications, that the Blood hath acquired in this Feaver, a disposition far removed from the natural, if it perverts much of the alible Juice, and then from its extraneous and incongruous mixture, the Liquor of the Blood is greatly disturbed, and the Spirits driven into confusion; if in the fits, the Blood too strongly, and in a long time burns forth, yet doth not truly subdue the feaverish matter, or exclude the whole, but that by its impure mixture, it is still more and (in every feaverish fit) more infested, and the Spirits being continually consumed, it becomes poorer, we may pronounce the Life of the Patient to be in much danger. Besides these, if the Vices of the Nervous Juice happen, that being altered from its due temper, or being too dull, and as it were lifeless, little actuates the Brain and nervous Stock; or being above measure sharp, continually provokes the same into Convulsions and Distractions; and if besides the vaporous Effluvia's continually falling away from the Blood, or the adust recrements being wont to be sifted forth by a critical Sweat, should be transferred into the Head, and there induce Lethargic or Phrensical Distempers, the hopes of Health will be little, and we may fear a very deadly event.

Concerning the Cure of this Disease, the Intentions will come under three Considerations chiefly. First, a quick reduction (as much as may be) of the Blood and nervous Liquor, to their natural tempers, or at least a prevention of their too great depravation. Secondly, Concerning the right handling the fits of the sick, it ought to be procured, First, that less of

the degenerate Juice may be gathered together for matter of the fit: 2ly, that what is gathered together, may be wholly dispersed by every fit, that thereby the sick may be better in the intervals: Thirdly, that the body being altered for the better, the fits may be inhibited by Anti-feaverish Remedies. The third intention respects the Symptoms chiefly urging, which should be timely opposed, whereby Nature, being not hindered, may reduce whatsoever intemperance may be contained in the Viscera or Vessels, may subdue and sift forth the extraneous Matter, and at length may recover a lively force, and pristine vigor.

First, therefore, for the reduction and emendation of the Blood and nervous Juice, diverse manners of Evacuations are wont to be exhibited in this Disease, about the beginning of the Sickness, with good success. It appears plainly from modern Practice, that Vomitories are of more noted Use in this Distemper, than in a common Tertian: wherefore in a robust body, and prone to vomit, about the beginning of the second or third fit, it is convenient to give an Emetic Medecine. The operation of this seems to be very helpful in this Feaver, forasmuch as it more plentifully evacuates the filth from the Ventricle, and the yellow Bile from the Choler-bearing Vessels; and because it copiously presses forth the serous Juice from the Emunctories of the Nervous Stock, planted about the Pancreas and Intestines, and by provoking them, draws it out. Wherefore we observe, that from a Vomit being taken, the sick do find themselves better about the Distempers of the Head. A Purge (to whom a Vomit is not convenient) may be ordered instead of it; the day following the fit, also tho an Emetick have been taken, it may be well permitted after a fit or two: But yet only with gentle and benign Physic, let it be performed, which will not disturb or too much move the Blood. We were wont in these Feavers, letting alone Diagridium or any Aloetic Medecine, only to give an Infusion or Powder of Senna, Rhabarb, and yellow Saunders, with Tartar and Salt of Wormwood, and to celebrate this kind of Purgation not very long after the beginning of the Disease, but at other times to keep the Belly soluble with the frequent Use of Clysters. Frequent Experience hath sufficiently taught, that Letting of Blood is highly profitable in this Disease; for when by reason of the Pores in every one, being more strictly closed than usual, the Blood growing hot, by the Feaver, wanted Ventilation, the Letting of Blood supplies the place of a more free breathing forth, and prevents the restrained *Effluvia* from so readily suffusing themselves on the Brain and nervous stock. But this Remedy is chiefly indicated from the very fervent Blood, and more hot temperament, nor ought to be indifferently used to old men, Phlegmatic, and other very weak Persons, unless perhaps in a small quantity, that the mass of Blood may be somewhat eventilated, and that the removal of the feaverish Matter into the Brain, may be hindered. If it be convenient to open a Vein, let it be done about the beginning of the Feaver, or at least before the fourth or fifth fit, *viz.* before the Blood is made very lifeless by the frequent deflagration, and rendered too impure by the confusion of the adust matter; because, if Rhlebotomy be made use of, whilst the Blood is highly corrupted, the Vital Spirits, and by that means the strength of the sick are more debilitated, nor yet is there any thing taken away from the power of the Disease, or from its Cause. There remains another famous way of evacuation, in this Feaver, to wit, Vesicatory Plaisters applied to various parts of the Body; these are commonly observed to be so helpful, that those that abhor and dislike very much such a Remedy, by the example of others being the better for them, have admitted them. By what means they separate the Cuticula from the Skin, and lift it up like a Bladder filled with Water, or whether they press forth this watery and limpid humor, out of the Arteries, or out of the Nerves, is not in this place to be enquired into; yet that they are profitably administered in this Disease, besides Experience, Reason seems something to persuade, because it in some manner compensates the want of Transpiration, by the large profusion of this kind of serous Latex: Moreover, this kind of Remedy, as it were, opens the ways and doors, by which both the Blood, and nervous Juice, may forthwith send forth by a proper purging, the extraneous matter, confused with them; wherefore, in the Plague and Malignant Distempers, Vesicatories are esteemed very profitable. Also it appears by common observation, that in this and other Feavers, frequent at the same time, they did prevent the more grievous Distempers of the Head, and were wont to help them, if they were brought in before: wherefore, Epispatic Plaisters may be applied about the beginning of the Disease, for preservation sake, to Phlegmatic Persons, Elderly People, and men of a more cold Temper; and they are wont profitably to be administered to several others, labouring with a Vertigo, Stupescation, or cruel Head-ach, for the Cure of the same Distempers. But in Constitutions very hot, where with the defect of the Serum, the Blood is too much burnt, and if those sick of the Feaver are obnoxious to Wakings, or a Phrenzy, with intolerable heat, Blisters seem then to be of little use.

For the mending of the temper of the Blood, and also the tenor of the Viscera, at vacant times, when there is leisure from purging, attemperating Remedies have place, and Digestives, which fuse the Liquor of the Blood, and separate its feculencies, and as it were by pre-

precipitating them, thrust them towards the Emunctuaries: For these sort of intentions, are wont to be given Juleps, and refrigerating Decoctions, sharpened with Spirit of Vitriol, of Salt, Tamarinds, or with the Juice of Oranges or Limons; forms of which choice enough are commonly to be had. Also for this end, acetous, saline, and shelly Powders are used, to wit, prepared out of Tartar, Salnitre, the fixed Salt of Herbs, of burnt Harts-horn, also the Claws and Eyes of Crabs. As for example, Take of Cream of Tartar drams three, of Salt of Wormwood dram one and a half; the Dose half a dram, in an opening Decoction, twice in a day out of the fit. Or take of Cream of Tartar dram one, of the Powder of Crabs Eyes dram one, of purified Nitre half a dram, mingle them; let them be taken after the same manner. Or take of Harts-horn burnt drams two, of the Spirit of Vitriol, what the Powder will drink up, the Dose is one scruple, it is of excellent use when those in Feavers are infested with Worms. These kind of Remedies promote the secretion of the feaverish matter, and also restore the almost destroyed ferments of the Blood and Viscera.

The second intention, *viz.* concerning the right handling the fits, comprehends more. First, There ought to be instituted a right order of Diet, whereby the more full heaping up of the degenerate Juice, for the matter of the fit, may be inhibited; wherefore, they are only to be fed with thin Aliments, and they must wholly abstain from Flesh (or Broth made of it) Eggs, strong Drink, and all rich Meats and Food whatsoever, and be contented only with Barly Broth, or Grewel, Panada, Whey, and small Beer; for that a more plentiful Aliment is not digested, or assimilated, but loads the Ventricle, and being powred into the Blood, disturbs its Liquor, and compels it to grow impetuously hot. In the beginning of the Fit, and the time of its duration, no food should be taken, unless for the allaying of thirst; But for the tempering of heat and thirst, Juleps, and cooling Decoctions, and especially small Beer: and Posset-drink should be granted. Secondly, a little before the coming of the fit is expected, a gentle Medecine may be administred, which may drive away the fit by preventing it, or make it more easie by procuring a Sweat: for this use the Febrifuge Potion of the most Learned *Riverius* serves well, of the Water of Carduus, with Oyl of Sulphur, and Salt of Wormwood: Or take of Cream of Tartar, of Salt of Wormwood, and the seeds of Nettles, each one scruple, let it be given in the Decoction of the Roots of Sorrel; when the Feaver begins to decline, and that the fits are a little more remis, proper Febrifuges, applied outwardly, often inhibit the comings of the fits. Yet in the mean time, so long as the fits of the Feaver return, the sick are to be handled so, that in every fit, the feaverish matter heaped in the Blood, may be thoroughly dispersed; wherefore, when Sweat hardly succeeds, it should be a little excited by temperate Medecines: Also the sick should be kept in bed, with a gentle breathing many hours, nor quickly permitted to rise; for I have often observed, that sick persons have been still worse, because impatient of their Bed, they have put on their cloaths before the vaporous Effluvia were sufficiently exhaled.

Thirdly, As to the Symptoms and particular accidents, wherewith the sick are wont to be infested in this Feaver, it is sufficiently provided for most of them, with Remedies, in the method of Cure hitherto described; again, thirst, the heat of the mouth, the scurfiness of the tongue, vomiting, the looseness, fainting, swooning, may be referred hither, very well the prescriptions commonly used in other Feavers: But what may seem to require in this Disease a peculiar Method of healing, are chiefly the Distempers of the Head and Brain, with the nervous Stock, which not being timely helped, may soon put the sick into great danger of Life: As to the Indications of these kind of evils of the Head, they are of a twofold kind; if it appears from a Stupefaction or Torpor, a Sleepiness, Vertigo, or Head-Ach, that the nervous Juice is become too dull, and as it were vapid or lifeless, and therefore doth not sufficiently actuate the Brain and nervous Bodies; besides the Remedies already delivered, and especially Vesicatories, Medecines full of a volatile Salt do chiefly help: wherefore Spirits of Harts-horn, and of Blood, also the Salts of them, are of excellent use; but if the nervous Liquor be too sharp, or the effluvia suffused from the æstuating Blood, drive the Animal Spirits into confusions or distractions, Remedies of the same sort of volatile Salt are administred with success in a little smaller quantity. Besides, a frequent letting of Blood, and allwaging Medecines against its Fervor, help much; as Emulsions, Whey, and simple Water, plentifully drunk; Opiats are cautiously to be given in this Feaver, for the Phrensie being often allayed by them, is changed into a Letargy, or a deep Stupefaction.

THE AUTHORS EPISTLE

(To the *Treatise of Urines*)

TO

Dr. Bathurst.

Worthy Sir,

THE Inspection of Urines, and from thence an investigation of directions concerning the Medicinal Practice, began to be esteemed among the Ancients, even from the first beginning of Medicine: for from hence for the making of judgments concerning the Sick, and for the chusing the most fit times for Curing, the great Hippocrates hath chiefly taken both his prenotions, and his precepts, so that that famous and to this day approved statute of old Medicine, to wit, *in urina capere verum*, to compose Medicine according to digestions, cannot be observed without rightly consulting the Urinal. Also this seems consonant to common reason, that for as much as we cannot search into the most intimate parts of the sick Body, as it were a Vessel shut up, judgment is sought from the infused liquor, washing all its parts, and taking from many some little parcels. For neither more certainly do the acidulous or Spaw-waters, shew the nature of the hidden Mine, through which they are strained, than Urines give testifications of the divers manners of dyscrasies of our Bodies, and their habitudes. Wherefore the Contemplation of this Excrement, (as vile as it is) hath grown to a Science, and hath exercised the ingenuities of the most excellent Physicians, both Ancient and Modern. Concerning this thing there are many Books extant, writ with great diligence; in which are rehearsed the great differences of Urines, varieties of Colours, and diversities of Consistence, and their Contents exactly described; and distinct precepts are delivered for every excretion of them: Which indeed are esteemed by some of so great certitude, that from the inspection of the water, a signification is sought of any Disease, or of the part affected; yea of every accident concerning the sick. But in this the Common People are egregiously deceived, and still pertinaciously will be deceived, whilst they imagine the knowledge of every Disease, and the prognostication of it cannot be found out, but by inspecting the Urine; and esteem a Physician of little worth unless he undertakes to divine from the Urinal as from a Magical Glass. But indeed, as to what belongs to the Precepts, and Rules whereon the reason of Judgment by Urine doth depend, there are many collected by diligent observation, that are extant, and from thence establish'd with good Reason and Judgment: yet for as much as the signification of Urines is by some too largely extended to particular Cases, very many uncertain things interwoven, and some obnoxious to deceit, and others plainly false; therefore who shall confidently pronounce concerning the business of the Sick, by the judgment only of the Water, deserves rather the name of a juggling Quack, than of a Physician.

But this Doctrin concerning Urines, abounds so ordinarily with errors, that the observations which belong to its practice, are either wrongfully made, or not well reduced into method. We may lawfully suspect that the observations are not rightly made, because perhaps from one or two particular cases, oftentimes a general rule is established. For Example sake, because some Hydropical people render a thin and watery Urine, therefore it is affirmed, such sort of Urines necessarily denote a Dropsie, when also in some other Diseases such like Urines are made; and sometimes in the Dropsie, the Urines are thick, and full of redness. Also as it is most commonly received, that Urines on which a cream doth swim (as in water that hath Tartar boyled in it) doth denote a Consumption, which is most uncertain, because this sign is more proper and familiar to Hypochondriacks than to Consumptive people: And how many dye of Consumptions without this? Besides, what is generally asserted, to wit, that in all diseases whatsoever, Nature doth make known the Disease by the Urine, is altogether false; because sometimes sick people make their Urine like healthful people; and sometimes those who are very well in health, by reason of some accident (perhaps from the meats eaten) have suspected Urine, varying from the natural state or condition. As to what belongs to the method, or doctrine delivered by most, concerning Urines, they seem to be altogether Empirical, and nothing rational: for the naked differences of Urines are rehearsed, and are wont to be distinguished according to their colour, consistency and contents: thence are opposed to the several species of these pathologick significations, collected only from more rare observations; when in the mean time, the causes of the appearances, nor of the preternatural alterations in the Urines, are not assigned, as they ought to be; nor is the signification of the Urines applyed to the Causes of Diseases, but only to the Disease or Symptom; and therefore it is most often deceitful, and uncertain; because the same morbidick Cause, and signification of the same Urine, may in like manner mediately respect at once divers Diseases, and Symptoms. As for Example, a thin and watry Urine, most often immediately denotes Indigestion, or a defect of Concoction in the Viscera: nevertheless, by reason of that condition of Crudity, the Green-sickness in Virgins, sometimes the Dropsie, or the white watery phlegmacy, sometimes Head-aches, and many other diseases arise. But the task which you have required of me, Worthy Sir, to wit, that the notions which in times past we have discoursed together, and conceived concerning Urines, as it were collected notes, and what have since fallen under my own knowledge, by my proper study and observation, concerning this thing, should be fram'd into a little Treatise, and that I should write a plain and new method of Urinoscopia. I confess the work greater than can well be performed by our own proper strength: however, I have resolved as much as I am able, to obey you therein. But that a Doctrine or Method concerning Urines may be instituted, beyond the vulgar and plainly Empirical manner of Philosophising, there shall be these two heads of our Discourse. To wit, First that the Anatomy of Urine may be delivered, of what elements and parts it consists; and also its genesis in our Body; to wit, by what Concoction this kind of Liquor is made, and then by what secretion of some Particles from others. Secondly, That the inspection of Urines in the Urinal may be truly unfolded, and what may be the Rules, and the Certitude of Uromancy, or divination of the Urine.

OF URINES.

CHAP. I.

Of the Elements and chief Accidents of Urine.

WHEN the Liquor of the Urine, being either fresh rendred from the body, or putrified by a long digestion, is exposed to a spagirick Analysis, it is wont to be resolved into these parts or principles: In the Distilling, First, ascends whatever of a vinous spirit is in it, diluted with water; but yet in so very small quantity, that it is not easily to be perceived by the taste it self. To this follows a watry liquor, large enough in proportion, with which are mixed some more loose particles of Salt, and Sulphur especially. Thirdly, There is stilled forth a very penetrative water; which is commonly called the spirit of Urine, but in truth almost without any vinous spirit, and is chiefly phlegm highly sharpened with Salt, and therefore it ascends last, as in the distillation of Vinegar: but forasmuch as the salt of Urine is volatile, but that of Vinegar only in the Flux; therefore the liquor stilled forth, which is greatly impregnated with its particles, is very acide: That which is imbued with the saline Particles of the other, is exceeding sharp and pricking. It is a sign that this kind of Spirit of Urine (as it is commonly known) owes its sharpness chiefly to the Salt, because, though it be most subtil it will not take fire, but being put to it extinguishes it. After the humidity is wholly exhal'd, another portion of Salt remains with the Earth of the cucurbit; to which if a more hot fire be made, that Salt will be sublimed into the Alembick, and the earthy feces only remain. This kind of Anatomy of Urine plainly shows, that the Elements of which its liquor is composed, are a great deal of Water and Salt, and a little of Sulphur and Earth, and a very little of Spirit.

The saltness in Urines is perceived by the taste and touch; it comes nearest to a Nitrous salt in favour: It is drawn indeed from saline Particles of things eaten, which being more plentifully exalted by the concoction in the Bowels, and the circulation in the Vessels, for the most part go into a Volatile Salt. That is truly Salt and Spirit, by reason of the long accompanying of either together, are gathered into a most strict bond; and therefore it happens, that the Salt it self otherways fixed, is carried up on high, and rendered able for motion, as it were by the wings of the other. Urines contain in them more or less of Salt, according to the disposition of our body, and have it either volatile or fixed, which are therefore of a divers colour and consistency.

That there is Sulphur contained in Urines, their quickly putrifying, and stink, sufficiently testify: it arises from the fat and sulphureous Particles of Meats, in the concoction being most minutely broken, and boyl'd with the serum and salt; so as also there is less plenty of Spirit in it, than is in Blood, Soot, or the Horns of Animals: wherefore in the distillation of Urine, there ascends nothing almost of an oylie form or fat. But indeed, whilst the blood is circulated in the Vessels, the spirituous and sulphureous little bodies, which fall away from it, do for the most part evaporate out of dores; in the mean time, the saline recrements, and the watery, chiefly constitute the Piss: nevertheless, Urines do always participate a little of sulphur, but its quantity and proportion, is diversly altered according to the various degrees of Concoction and Crudity, and thence also the colour and consistence receive many mutations in Urines.

That there is but a very little of vinous spirit in Urines, the defect of it in the liquor distilled forth, also the soon putrifying of the Stale do testify: but that there is some, the intestine motion of the Particles in the Urine doth argue, to wit, the departure of the thin from the thick, and the spontaneous separation of some parts from others, and a collection of them into a settlement: besides, the saline Particles (for that they are made volatile) are married to spirituals, and so they are of a more ready motion, and energy; yet according to the divers plenty of Spirits in Urines, and their power, there arise divers manners of hypostases and settlements; also the Urines themselves, sooner or slower putrify.

The watry part of the Urine far exceeds the rest in quantity, and is greater than they by almost a sixth part: it is not so simply drawn forth by distillation, but that some Particles of Salt and Sulphur (forasmuch as they are volatile) ascend with it, and impart to the water an ingrateful stink: the potent matter, copiously taken with aliments, affords an original to this; which of what kind soever it be, before it is changed into Urine, lays aside its proper qualities, and acquires others; for truly, from the assumed liquor, there is nothing sincere almost left in the Piss, besides meer humidity.

That there is earth, and muddy feces to be had in Urines, its distillation, or evaporation sufficiently declares: for when the rest of the parts are exhaled, the earth as it were a *caput mortuum*, will remain in a moderate quantity in the bottom: Forasmuch as in the nourishing juice, there is required something solid besides the active principles of salt, sulphur and spirit, whence the bulk and magnitude of the body grows; the recrements of this, *viz.* the earthy seculencies, are plentifully dissolved in the serum, and contribute to it a thick consistence and contents: but these shew themselves after a divers manner, according to the state of Concoction and Crudity.

These are the principles which constitute the body of the Urine, also into which it is easily resolved, by a Chymical Analysis: out of the divers changes, and various contemperation of these, the other accidents of Urine arise, *viz.* Quantity, Colour, Consistency, and Contents, which are as to the sense the most notable concerning it, and the chief objects of the tendered Urine: For when there is nothing beheld besides in the Piss, they constitute these first *Phænomena*, in which rightly solved, consists the whole Hypothesis of this Science: Wherefore we shall speak in the next place, concerning these, and first of the Urine of healthful People, what its quantity may be, how coloured, with what consistence and contents indued; and together shall be unfolded, out of what mixture of Elements, and by what Concoction in the *Viscera*, and Vessels, each of these depend. Secondly, shall be shewn how many ways the Urines of Sick People vary from the square or Rule of this of the Sound: and I shall endeavour to assign, for the several differences of them, proper Causes of their alterations; and these shall conclude our first proposition in this discourse, *viz.* the Anatomy of Urine.

CHAP. II.

Of the Quantity and Colour of the Urines of Sound People.

THE Quantity of the Urine in Sound People, ought to be a little less than the humor, or liquid substance daily taken, for moist and drinkable things daily taken, are the matter it self of which Urines are first made: But these (hunger and thirst urging) are more plentifully required, both that they may sufficiently wash the mass of the Chyme, by which means it may rightly ferment in the *Viscera*; and that they may serve for a Vehicle, both to the Chyme, whereby it may be conveyed to the bloody Mass, and to the Blood it self, that it might be circulated in the Vessels without thickening; and to the Nervous Juice, whereby it might actuate and water the Organs of Sense and Motion: when the serous *Latex* by this means hath bestowed whatever it hath almost of Spirit and Sulphur, for nourishment, Heat and Motion, it gives way to a new nutritious humour; and it self as unprofitable, being secluded from the Blood, by the help of the Reins is sent away. The nourishing liquor, which will at last be changed into Urine, of its own nature is divers, *viz.* now watry, now impregnated with Spirit, now with Salt and Sulphur, and according to the various forces of this or that Element in it, Urines are wont to be somewhat altered: However all liquors taken in at the mouth, do not pass thorow our body whole and untouched; but that they undergo mutations in various parts, and lose a little portion of their quantity, before they are made into Urine: For the *Latex* or Humour to be converted into Urine, is first of all received into the Ventricle, (for I assent not to *Resfazer*, who affirms the same falling for the most part on the Lungs, to cause the more quick making water after drinking) whilst that it stays in the Ventricle, it is there boyled; also impregnated with Salt and Sulphur of its own, or from more solid Aliments dissolved: then very much of it is confused in the blood, with the nourishable juice, which when it is a long time circulated, from thence receives a farther tincture of Salt and Sulphur, according to the various temper of the blood, and its inkindling in the Heart: Hence some portion of it is derived with the Animal Spirit, to the Brain and nervous stock; and afterwards from thence, being made lifeless and weak, is lastly reduced into the bosom of the blood; after that it hath bestowed on the Blood and Nervous Juice, whatever of generous or noble is contained in the Serum, also no small quantity is consumed by sweat and the other excretories; what remains, whilst that the Blood continually washes the Reins, a precipitation being made, either by a straining or force of a certain ferment, it is there separated from the Blood, and from thence passes thorow the Ureters into the Bladder, and so is carried forth of doors.

From the origine and lustration of the *Serous Latex*, but now described, it plainly appears, that the Urine ought to answer to the quantity of the liquids taken, in somewhat a lesser proportion, perhaps under a third part: which plainly shews the disposition and strength of the *Viscera* serving for Concoction, as also the temper and distribution of the blood it self, and after a sort, of the nervous juice; moreover it carries with it signs of the affections of the Urinary passages. The quantity of the Urine declines often from this Rule, so that sometimes it superabounds, also sometimes is deficient: and either for a short time, may consist with a disposition not much unhealthful; but if these kind of distempers continue long, they argue a sickly condition. Concerning these we shall speak among the appearances of the Urine in a diseased condition of the Body; we shall now next consider the colour of a sound Urine.

The Urine of Sound People, which is rendred after Concoction is finished in the Body, is of a Citron colour, like Lye a little boyled: which without doubt proceeds from the Salt and Sulphur of the nutritious juice, and the Blood, dissolved in the Concoction, and boyled in the Serum. This colour doth not arise only from Salt (as some would have it) because the Liquor impregnated with Salt, unless it be evaporated to a certain thickness, will not grow yellowish: Also Salt of Tartar, being dissolved by melting, continues still clear. What may be objected concerning the Lye of Ashes, I say, there the whole Sulphur is not consumed by burning, but the Citron colour arises from some saline Particles, and others Sulphureous burnt, and sticking together in the Ashes, and then infused or boyled in the liquor. Neither doth the Urine of sound People acquire this same colour from Sulphur only, because Sulphur in a watry Menstruum, is not dissolved unless by the addition of Salt, nor will it give any tincture of it self; but if Salt of Tartar and common Sulphur be digested together in water, or if Antimony be boyled in a saline Menstruum, both liquors will by that means grow yellow like Urine; after the like manner, the saline and sulphureous Particles of Aliments, being incocted and most minutely broken in the Serum, by a Digestion in the *Ventricle* and *Intestines*, and by a Circulation with the Blood in the *Arteries* and *Veins*, impart to it a Citron Colour.

This kind of dissolution of Salt and Sulphur, by whose means the Urines are made of a Citron Colour, is first begun in the *Bowels*; and afterwards perfected in the *Vessels*, and very much depends upon the Concoction performed in the *Ventricle* and the *Intestines*: For here, by the help of heat and of ferments, the Aliments taken are chiefly subdued; the bond of mixture being broken, the saline and sulphureous Particles being most finally broken, and made small, go into a milkie Cream, and from thence the Serum remaining after that Concoction and Distribution of that milkie juice, becomes of a Citron colour: after the same manner, as when the Salt of Tartar and common Sulphur being dissolved together, and mixed with some acide thing, indue a milkie colour; then the contents being separated by settling, the remaining liquor grows yellow like Lye. If that the aliments, by reason of an evil disposition of the *Ventricle*, are not rightly digested in the first Concoction, as in the *Longing Disease* or *Pica*, the *Dropsie*, and other ill dispositions of the *Bowels*, usually comes to pass, the Urine also is rendred crude, clear, and almost insipid, like Fountain water; but if by reason of the ferments of the *Viscera* being more than duly exalted, or otherways depraved as in the *Scurvy*, *Hypochondriac* distemper, or *Feverish* intemperance, the Particles of things eaten are too much dissolved in the first Region, by that means Urines are rendred red and thick.

The Serum, as hath but now been said, being imbued with a Lixivial Tincture in the first Concoction, and confused in the Blood, so long as it is circulated with it, it is yet further concocted, and acquires a more deep colour; for the particles of the Blood being roasted and scorched, although for the most part they are laid aside into the Gall bag, yet being in a manner boyled in the *Serous Latex*, they heighten its colour; hence the Concoction being ended, the Urine which is first made, is more pale, and that which is last, more red. That which is made after long fasting, is yet more high Coloured. Where the Blood is more cold, as in *Cachectical* people, the colour of the Urine is made less; where the Blood grows raging with a feverish Heat, and is roasted, the Urine grows highly red.

Concerning the Urines of sound people, it is worth observation, that which is made after plentiful Drinking, hath no tincture, but is pale like water; of which we shall enquire, by what means the *Serous Latex* so suddenly slides away out of the *Ventricle*, (contrary to what is vulgarly believed) and passing thorow all the Chyliferous passages, then the *Veins*, *Arteries*, the bosom of the Heart it self, and the turnings and windings of the *Veins* and *Ureters*, is put forth of the Body within so short a space: moreover, how it comes that the Urine being so precipitately made, contrary to most other things, is not only changed into no Colour in its passage, but it also loses its own proper colour: For as the Proverb is, *Our Drink goes thick in, and comes forth thin*; or *We Drink thick Beer, and Piss clear*.

Concerning this we say, that besides the long wandering of the nourishing juice, to wit, whereby, after some stay in the *Ventricle*, it slides into the *Intestines*, and from thence thorow the milkie Vessels into new passages, and thence is carried into the *Veins* (which carrying about cannot be quickly performed) it is most likely, that there is another nearer passage of the same nutritious Juice, whereby indeed it may be conveyed immediately, and without delay, to the Mass of Blood, and perhaps to the nervous Liquor; and therefore, after fasting, there immediately follows a most quick refection of strength and Spirits, after Eating, and especially after Drinking; which indeed cannot be thought to be made by the Spirits and Vapours; also from such drinking the Urine is presently rendred, and indeed sooner than it can be

be thought, that the Mass of the Chyle can be sent out of the bosom of the Ventricle; wherefore, it is not improbable, that when the Alimentous Liquor is entred the Ventricle, presently the more thin portion of it, which consists chiefly of Spirit and Water, is imbibed by its Spongy Membranes; and from thence being instilled into the little mouths of the Veins, it is presently confounded with the Blood flowing back towards the Heart. For of this opinion (though not very stubbornly) I always was, *That the Chyme was in some measure immediately derived from the Ventricle, and Intestines by the branches of the Vena Porta, into the Mass of Blood*; and as the milkie passages carry it about by a long compass, whereby it may be instilled into the descending Trunk of the *Vena cava*; so that it may be carried in a more near way, *viz.* into the ascending Trunk of the same, by these Vessels; forasmuch as the Blood being made poorer in its Circulation, returning from either part, before it had entred the heart, it ought to be refreshed with a new juice, whereby it might more lively ferment in the bosom of the heart; but forasmuch as the much greater part of the Blood is carried upwards, surely it may seem agreeable to truth, that at least some portion of the nourishing Juice may be added to this, as it were a sustenance, it being before burnt forth, and almost lifeless, for its new inkindling in the heart. The Arguments that seem to perswade to this, not of light moment, I could here heap together, but I should so divert far from our proposition: wherefore, that we so suddenly make a watery Urine after Drinking, I esteem to be done after a manner as was but now said; therefore the Liquor that is carried so hastily from the Aliments to the Mass of Blood, passing thorow the so narrow windings (as are the Membranes of the *Viscera*) being drawn as it were by distillation, the more thick matter being rejected, consists almost only of Water and Spirit; with which indeed it refreshes the vital Spirits, and dilutes the Blood; about which task, when the spirituous part is consumed, the watry Latex, because of its plenty, being heavy and troublesome, is continually sent away by the Reins; and when it comes from the Ventricle, not yet imbued with Salt and Sulphur, nor is long circulated with the Blood, that it might by that means acquire a lixivial tincture, it is rendered thin and clear.

CHAP. III.

Of the Consistency and Contents of the Urine of Sound People.

SO much for the Quantity and Colour of Urines, which proceed from a sound Body; but as to what belongs to the Contents, we must know, that there ought to be nothing besides the Hypostasis in a sound Urine; but what this is, and by what means it sinks down, remains to be unfolded in the next place.

So long as the Mass of Blood, being fused with the serous and nourishable humour, is continually circulated in the Vessels, from it a certain nutritious juice is made, by a perpetual digestion, which being put continually to the solid parts, goes into nourishment: This first of all is digested into a glutinous humour, like the white of an Egg, afterwards into thin Filaments or Rags, which being interwoven in the Pores, and little spaces of the solid parts, still afford to them an increase of new substance; but whilst the Serum being mixed with the Blood, washes all the Regions of the Body, it sucks up into it self a certain superfluous portion of this last Aliment, to be lay'd on the solid parts, and carries it forth of dores with it self; and this it is that constitutes the Hypostasis or settlement in Urines; wherefore so long as this is present, it indicates how far Concoction and Nutrition in some measure is performed, and is accounted a laudable sign; its absence shews Crudity and Cachectical people, or a *Dyscrasie* in Fevers; it consisting of small Threads or Filaments, is dispersed at first thorow the whole body of the Urine, and then is collected into a little Cloud, by this means. These Filaments or Threads, are long, and smooth, also indued with some sharpnesses like Brier-pricks, that from thence being shaken about, they easily lay hold of one another, and are fastned together; even as if unto an Urinal full of water, you should cast many Hairs, and then by shaking about the Vessel, the hairs at first swimming dispersedly, in a little time would lay hold on one another, and be collected into a little bundle; after the same manner (as it seems) the little threads which constitute the Hypostasis or settlement being variously here and there agitated by the Colour and Spirits implanted in the Urine, intangle and thrust upon one another, until they gather into one little Cloud by the mutual knitting of all together; and because these Filaments are compacted, and more solid than the other Contents of the Urine, they sink towards the bottom with their weight.

It is very likely, that these kind of Filaments, make the Hypostasis in the Urines of Sound People, for that the Blood being well constituted, and disposed to nourishment, is very much stuffed with Fibres, or white Filaments: because, when a Vein is opened, if the Blood let out be received into warm water, it will be conspicuous to any one; for the red thick substance being diluted with the liquor, these
smooth

smooth and white threads swim in the water; wherefore it seems, that some of these thin or slender rags, being snatch'd away with the serous juice, are the matter of this cloud subsiding in the Urine; wherefore in Cachectical people, by reason of Crudity, the Blood being very waterish, and unfit for nourishment, is destitute of these well labour'd Fibrils; also in *Dyscrasies*, when the nutritious humour, the Blood being too much scorched, is not rightly concocted into these kind of Filaments, the Hypostasis in Urines is either wholly wanting, or is very confused and disturbed.

It is said to be a good and laudable Hypostasis, which is of a whitish colour, of a round and equal figure, and sinks towards the bottom, to which are required, First, that that last Aliment be rightly labour'd, whereby the Filaments may become white, smooth and solid, like to slender Fibres. Secondly, That the Urine be sufficiently strong in spirits, which (as is beheld in the growing hot of Must, or new Wine) may agitate, and compel here and there all parts. Thirdly, that the liquor be not too thick, nor that its Pores be first possessed by strange bodies, whereby the motion of the contents may be hindred, but that a sufficient space may be left; for the free agitating and tossing about these kind of Particles.

If the substance be red, it is a sign that that last Aliment is scorched and burnt, with too much heat; wherefore such a sediment, for the most part is in the beginning of a Feavour, so long as the Coction in the Viscera and Vessels, is not wholly perverted; if the Hypostasis be broken and unequal, it is a sign that the nutriment destined for the solid parts, is not rightly and equally concocted, and that its Particles are not homogeneous, and alike in every part: wherefore the Filaments do not cohere together, but these with those, and they with others, are entangled apart; hence some more thick descend towards the bottom, and others more light swim upon the top. When the Hypostasis does not wholly sink down, but hangs all of it, either in the middle or upper Region, that happens, because that those Filaments are not perfectly laboured, nor solid and compact, but more rare and spongy, or because the liquor is thicker, and more impregnate with Salt and Sulphur, and therefore like Lie it sustains some weights, which otherwise would sink to the bottom. Sometimes the Hypostasis is wholly wanting, in sound people, after long fasting, immoderate labours, or copious sweating, the matter being wholly consumed into nutriment, or evaporated by sweat; in Fevers, by reason of the very depraved condition of the Blood; also in the *Pica*, *Cachexie*, and other Distempers of that kind, by reason of the great Crudity.

Concerning the consistency of the Urine in sound people, there is not much worthy consideration to be met with: It is wont to be of that sort, as middling Beer is, being purified by a long Fermentation; or Lye a little boyled, *viz.* the watry liquor of the Urine, ought to include in its Pores and passages, a great many Particles of Salt and Sulphur, most small broken and dissolved; and besides a little of earth, divided very exceeding small, and dispersed thorow the whole body of the Piss, if the consistence be thinner than it ought, as it is in clear, or limpid Urines, and watry, it is a sign of indigestion and crudity; that the Aliments are not fully overcome, and concocted; but if the Urine be thicker, and closer than it ought, it is a sign, that the body of the liquor, is filled with preternatural Contents. But of these elsewhere, when we shall speak of the Urines of the sick.

Thus far of Urine, so far as it is an Excrement, and sign of Concoction in a sound body (truly performed in the Viscera and in the Vessels) the quantity or bulk of which is to be determined by the potent matter; the colour Citron, from the dissolved Salt and Sulphur, and boyled in the Serum; the Hypostasis or Contents depend upon the Filaments, elaborated in the Blood, for the nourishment of the solid parts; the consistency on the Salt and Sulphur, together with the Particles of Earth, filling the Pores and passages of the serous liquor. It next remains, that we treat of the Urines of Sick People: in which also, the Quantity, Colour, Contents, Consistence, and some accidents besides, offer themselves to consideration.

CHAP. IV.

Of the Quantity and Colour in Urines of sick People.

IN a Morbous provision of Bodies, or Sickly estate, the quantity of the Urine does not exactly quadrate with the proportion of the liquid things taken; for sometimes it wants of its due measure, and sometimes exceeds it. When the Urine is much less than the drinkable things taken, the reason is, because the watry Latex either stays somewhere in the Body, or is diverted by some other way of Excretion, than by Urine: if it remains within; First, it is either heaped up about the Viscera, and their Cavities, and so is stay'd now in the Ventricle, more than it ought to do, and induces by the distention of it, troubles, with spitting; but more often, it is laid up in the hollowness of the Abdomen, and sometimes of the Thorax and head, and there is wont to cause Hydropic Diseases. Or, Secondly, the Serum stagnates in the Vessels, and so increases the bulk of the Blood, and Nervous Liquor, and notably perverts its motion; whence Catarrhs, Rheumatick distempers, and often Palsies and Convulsions are caused. Or thirdly, this watry humour is fixed in the habit of the body, and so creates a swelling up of the whole body, or of some parts. Or fourthly and lastly, it is obstructed in the urinary passages, by the Stone, or thick matter, as it were a dam opposing it; and causes in those parts pains and Convulsions, and a fulness of the Serum in the whole body. When the serous water is other ways bestowed, the Patients are for the most part prone to frequent and troublesome Sweats, or almost to a continual Loosness.

The distempers therefore which the small quantity of the Urine is wont to indicate, are sometimes the swelling up of some of the Viscera, and a heaping up of water in them, sometimes Catarrhal distempers, sometimes evil dispositions of the nervous stock: sometimes an Anasarca and watry Tumors; and sometimes the stony disposition of the Reins and Bladder. And sometimes also the diminution of the Urine is the effect and sign of some other preternatural evacuation, viz. an immoderate excretion of Siveat, Lask, or some other thing. To describe here exactly all the subsistences of the serous Latex, either in the body, or the causes of it other ways excreted, and the manner of doing it, were to transfer hither almost the whole matter of Pathology; for many and divers are the occasions and circumstances, whereupon this Serum is heaped up in this or that part, and subsisting in the body, diminishes the quantity of the Urine; but for the most part the principal and most frequent cause of this consists not so much in the fault of the Liver, Spleen, or Reins, as of the blood it self: to wit, a copious and free making of Urine, as also its stay in the body, and only made in little quantity, depends chiefly on the temper of the blood, and either on its kindling, or fermentation in the heart: for if the blood be strong in rightly exalted principles, (viz. Spirit, Sulphur, and Salt) it grows very hot in the Vessels, and so the frame of the liquor being loose enough, it is duly kindled by the ferment of the heart; and almost spiritualizes the whole, passes through all parts with heat and a rapid motion, without stopping; and whatsoever is superfluous and volatile, evaporates out of doors: and whilst the blood is rarified, and boiling with heat, passes through the Reins; what is serous is easily separated, either by the strainer of the Reins only, or (which is most likely) by a coagulation, and is as it were precipitated from the remaining mass of the blood. The same thing almost happens after this manner to the blood, as we may observe in Milk, viz. whilst it is warmed, and grows hot, it most easily goes into parts, and its Serum is most easily separated by the least drop of Runnet, or Coagulum put into it: but if you pour much more strong and sour ferment into it, when it is cold, a precipitation will hardly follow; so if the blood becomes through an evil constitution, or ill manner of living, more cool and watry, that being less endued with active Elements, it grows but dully hot, and is but little kindled in the heart, it is circulated very slowly and difficultly in the Vessels; passing through the Pores and passages of the Viscera, it cleaves a little to them, and leaves something behind it; whence are gotten every where Obstructions and Tumors; also the blood by this means becoming viscous and cool, and so unfit for precipitation, or percolation lays aside less readily its excrements in the Reins; but leaves them every where in the body, because it hardly, and not without the residence of a certain humor, is circulated. Wherefore in this state, those things that move the blood very much, as exercise and a more quick motion; or also such as may fuse it, as it were with a Coagulum or Runnet, as are sharp things, and preparations of Salts, will more freely provoke Urine.

It sometimes happens, that the Urines of the sick are made in a large quantity, and very profuse, that a day and a nights space, they make perhaps twice or thrice as much water as the Liquids they have taken; the causes of which distemper are also various, and the significations very divers; if after the suppression in of Urine, or its quantity formerly lessened, if in Hydropick distempers, Rheumatisms, or passions of the nervous stock, or in the Crises of Fevers, a flowing down of the Urine follows, either of its own accord, or by the use of Diureticks, it denotes a Cure of the disease, or preternatural disposition, or at least a declining of it. But if (as I have often observed) in a lean and weak constitution (without any of the previous

previous distempers but now recited) the Urine exceeds much the Liquids taken, and from thence a great debility of the whole follows, this indeed signifies an evil disposition, with a tendency to a wasting or Consumption. I have known some women of a tender and most fine make, who sometimes being ill, for many days, were wont daily to make water in a great abundance, (exceeding twice the Liquids taken) and that watry and thin, without contents or settlement; at which time they have complained of a languishing of strength, difficult respiration, and an impotency to motion. I suppose in this case, that the blood and nervous juyce grow too sour, from the salt carried forth, and suffering a Flux, and therefore that they are somewhat loosened in their mixture, and fused so much into serosity, as to be made fit for it. For it is to be observed, that all Liquids, though more thick and mucilaginous, if they be kept to a sourness, presently become for the most part watry and limpid: also the flowing down of the Urine is sometimes seen to arise from such a disposition of the blood and humors: for that the Urine so copiously excreted, is like Vinegar in taste; and these kind of distempers are usually cured, chiefly by Chalybeates, and not by binding and thickning things.

But as to what respects the Colour, the Urine of sound people may be the square or rule, to which all the rest of the sick may be referred; for as the colour of sound peoples is Citron, the Urine of the sick is paler than Citron, and so either watry, or white, or higher coloured than it; whose chief kinds are, flame-colour, yellow, red, green, and black. I shall run through every one of these briefly, and endeavour to weigh them together, by what causes all the alterations may be made, and what distempers, or provisions of diseases they are wont to make known.

The Urine is watry or limpid, when by reason of the indigestion of the Ventricle, the saline and sulphureous particles of things eaten, are not rightly subjugated, nor being smally broken, are made so volatile, that being dissolved in the Serum, they may impart to it a tincture, which it may carry with it, through the several turnings and windings of its passage: For the Latex or juyce to be changed into Urine, because it is forced through very secret passages, and narrow, as it were by a certain distillation; therefore it is wholly deprived of the colour and consistency, which it had from the taken Liquids, and imbibes almost nothing, but the volatile part, from the Chyme, whose Vehicle it is. Wherefore, if by reason of the great crudity, the Salt, Sulphur, and other contents are not first made volatile in the Viscera, nor afterwards dissolved in the Vessels, that they may make their passage together with the serous juyce; it being at last stripped almost of all, is sent out like clear water. That such Urines do want the active principles, it is a sign, because they are kept a long time from putrefaction: This sort of Urine denotes in Virgins, for the most part, the Green-sickness, in most the Cachexy or Dropsie; in all it is a note of Indigestion and crudity. Sometimes in those obnoxious to the Stone, it foretels the approach of the fit, viz. whilst the Serum is coagulated by the stony juyce in the Reins, its dissolutions and contents are congealed into a tartareous matter, only a watry juyce or Latex staying behind. Those who for some time make a thin and watry Urine, what ever sickness they are obnoxious to, have often adjoined to it a difficulty of breathing, and shortness thereof after motion, and distention about the region of the Ventricle, and as it were a swelling up after eating. The reason of the former wholly depends on the defect of spirits in the blood, because its liquor is not fully imbued with active principles (of Spirit, Sulphur, and Salt) rightly exalted; therefore it is not sufficiently kindled by the ferment of the heart, whereby the whole may presently leap forth, and break as it were into a flame: but that hardly fermenting, and being apt to stagnate in the heart, and for the most part to reside there, burdens it grievously: wherefore if the blood so disposed, is urged more than it is wont, by a more quick motion, into the bosom of the Heart, because not being rarified of its own accord, it may presently go wholly forth, therefore there is need of great endeavour of the Lungs, and a more quick or frequent agitation, whereby it may be carried forth. Therefore watry Urines signify this kind of Crudity in the blood; because, for as much as they receive no tincture almost from the Salt and Sulphur, it is a sign that the Particles are little dissolved in the mass of blood, or are rendered volatile. As to what appertains to the inflation of the Ventricle (of which also limpid or clear Urines are the effect and sign) I say, because of a defect of due Fermentation, the Chyle goes not into a volatile Cream, but (like bread not fermented) into a sad and heavy mass, which indeed is slowly, and not without a residence of viscous Phlegm, carried out of the stomach: its reliques being impacted in the folds and Membranes of the Ventricle, obstruct all the Pores and passages, that nothing may vapour forth, nor that the thin and spirituous part may be conveyed (as it ought to be) by the secret passages, to the blood: hence flatulencies are begotten, which continually distend the Ventricle, and blow it up beyond its due bulk: also when those Feculencies are left a long time in the stomach, they abound in a fixed Salt, and degenerate now into an acid, now into a vitriolick matter, or of some other nature; from whence Heart-aches, desire of absurd things, oftentimes Heat with cruel thirst, and sometimes Vomiting arise: some of which though they argue a very sharp heat to lye hid within, yet by reason of the want of concoction, such distempers often render the Urine crude and watry. We have treated thus largely of a limpid or clear Urine, because from hence the reasons of the rest (which as to colour and consistency are pale and thin in healthful persons) may be drawn. For from the Salt and Sulphur, more or less dissolved and boiled in the Serum, the appearances of a pale and straw-coloured Urine, and of other colours, under a Citron colour, are excited; and by the like means, which was said of the watry, they may be unfolded.

There remains another certain kind of Urine, more pale than the Citron Colour, not thin but thick and cloudy, and of whitish colour; it appears by common observation, that children do often make such water, when they are troubled with the Worms: The reason of which seems, because the matter whereof the worms are made, is a certain viscid Phlegm, heaped up in the Viscera, by reason of the indigestion of the Chyle, and a defect of making or generating Spirits, which matter at first transmits no tincture to the Urine, because of its fixity, the same afterwards putrifying is exalted, and is in some manner volatilized; and then partly by heat and spirit, is formed into worms, and partly being confused with the passing Chyle, and carried into the vessels, when it is made unfit for nourishment, it is separated with the Serum from the blood, and being mixed with the Urine, gives it that white colour. Sometimes also in Fevers, especially of children, The Urine is whitish: the reason of which is, because the supplement of the nutritious juyce being poured from the Chyle to the mass of blood, is not rightly assimilated, degenerated into an excrementitious humor: A portion of which being inclosed in the Serum, imparts to it the thick consistence and milky colour: otherwise than in the Fevers of those of riper years, where when the heat is stronger, the same degenerate juyce impresses on the Serum a red colour. Also the Urine is whitish in the flowing of the Whites, the Gonorrhea, Ulcers of the Reins and Bladder; and of the Urinary passages, by reason of the confusion or mingling of the filthy matter, or the corrupted seed: howe-
 eves it be, that the colour of the Urine be white, it is produced from its contents, which at last putting down its settlement to the bottom, the liquor for the most part becomes of a palish and yellowish colour; even as it may be perceived by the making of the Milk of Sulphur, where the milky substance sinking down to the bottom, the over swimming liquor is of a Citron colour.

Urinæ whose colour is deeper than Citron, owe their appearance, not only to the Salt and Sulphur dissolved more than usual, but in some sort to the more thick contents in the liquor. The more plentiful dissolution of the Salt and the Sulphur, is chiefly performed in the vessels, in the mass it self of the blood, and from thence the Tincture is impressed on the serous Juyce: But this happens to be done for the most part, after a double manner, viz. either by reason of the feverish fervour, for as much as the blood boiling in the vessels, and being more kindled in the Heart, is very much loosened in its mixture, and so copiously fixes on the Serum the particles of Salt and Sulphur, waisted as it were by the boiling: Or without a Fever, when these kind of sulphureous and saline little bodies, wont to be sent forth at other sinks, are restrained; and so being by degrees heaped up in the blood, are poured into Serum. Of this also there are two cheif causes or means; for either the excrements of the blood, which chiefly participate of adust Sulphur, and that ought to be sent away by Choler-carrying vessels, are retained, and so they impress, being suffused on the serous humor, a tincture of yellowness: or else the Effluvia's, which are chiefly of a Saline nature, and ought to be evaporated by insensible transpiration, are restrained, and from those the urine is filled with a lixivial tincture. The Urines of the former kind are proper to people that have the Jaundice; but those of this latter are familiar to the Scurvy: for in the Scurvy the saline particles of the blood depart from volatilization, and get a Flux: wherefore, by reason of their fixity, they will not evaporate, and so being more fully heaped together in the blood, they more and more pervert its Crasis, and very much impregnate the serous humor with a saltness. The contents which heighten the colour of the urine, are of a twofold kind to wit, either adust recrements, remaining after the deflagration of the blood, or particles of the nutritious juyce, degenerated into an extraneous matter: Concerning which we shall speak hereafter in their proper place. It now remains that we describe particularly the several colours of urine more intense or deep than Citron colour.

1. The first is a flame-coloured Urine, which shines with a brightness like the Spirit of Nitre: and this is very often seen in an intermitting Tertian Fever; this colour arises from a portion of the thinner yellow Bile, mixed with the Serum, whilst it is in motion: for that in this Fever there is a sharp and hot intertemperature of the blood, which burns and scorches all the humors, and so plentifully begets Choler. But although this, for the most part, is separated from the mass of blood by the Biliary vessels and passages; yet when it abounds in the vessels, a part of it, or (which is the same thing) some burnt and adust particles of the blood and humors being boiled in the serous water, impart to it an high or deep yellowness. This urine is thin and shining, for that there is in this disease almost a continual breathing forth, that thrusts out the recrements of the nutritious Juyce, and all the thicker parts of the Serum towards the circumference of the body.

2. The Saffron-coloured Urine, and which dyes Linen with the same colour, undoubtedly is a sign of the Jaundice: it is tinged after this manner by the yellow Bile or Choler, or by the Salt and Sulphur burnt and plentifully mixt with the Serum: for the yellow Bile is necessarily begot from the yoked heat and motion of the blood; but for this the Gall bag is designed by Nature, for the separating it from the mass of the blood, its passages being rooted in the Liver: But if such a separation be any ways hindred, that humors flowing back in the blood, and copiously heaped together, infects the skin with its yellowness, the blood, and especially the serous Latex. The Saffron-coloured Urine differs from the flame-coloured, because in this only a certain portion of the more thin Bile is poured into the Urine, but in that the more thick part, and much more plenty: besides, in the yellow Bile the Sulphur, with the Salt, being joyned and long circulated, is fully dissolved by it, that it becomes like paint, imparting to every subject a Saffron-coloured tincture; as when common Sulphur and Oyl of Tartar are mixed together. But what things cause a redness Urins, without the reitagnation of this Bile, happen

happen after the same manner as in the Lye of Ashes: where the particles of the Sulphur, without any previous disposition from the saline, are forthwith put down with them in the Liquor.

3. It remains that we speak next of red Urines, which are of a divers habit, neither do they always depend on the same causes, nor plainly denote the same kind of distempers; we shall briefly run through the chief differences and proper significations of them. First, the liquor of the urine is either red of it self, and remains after the same manner, nor is the colour altered by the settling or sinking down of any of the parts: or secondly, the redness of the urine chiefly owes its colour to the Contents, which being settled to the bottom, the liquor grows yellow, or is less red. The distempers that these kind of urines are wont to shew, are chiefly Fevers, and a confirmed Scurvy, and Consumption. We shall now consider the reasons of each.

1. When the Urine that is made red so remains, it is first of a mean consistency, and somewhat clear, and then it owes its colour to the Salt and Sulphur, being burnt more than usual, and so boiled more copiously in the Serum: or secondly, such an urine is red, and also troubled and cloudy: but this, besides the contents of Salt and Sulphur, has boiled in it some earthy particles also, which indeed being impacted in the Pores and passages of the serous Latex, do not descend: because the liquor of the urine is destitute of convenient spirits, which may segregate all heterogeneous things, and drive them to the bottom, as it is wont to happen usually in dead drink, or Beer growing sour by reason of Thunder; where the liquor is infected with a troubled Feces, and by reason of the defect of spirits, will not grow clear; wherefore this kind of urine is a very bad sign in Fevers because it shews such a confusion in the blood of a dust and to be separated matter, such as the vital spirits are not able to master by taming and subjugating it.

2. Sometimes the Urine is made red, by reason of its contents; which settling in the bottom, the liquor becomes of another colour: but these contents, as before we hinted are twofold, viz. now thin, which are the remaining matter, or a dust recrements after the burning forth of the blood; now more thick, to wit, the degenerate particles of the nutritious Juyce; both these being torrifed, and separated from the burning blood, are partly thrust forth by Sweat, and partly mixed with the serous Latex, thicken its consistence, and heighten its colour, viz. so long as these kind of contents are included in the Pores and Passages of the liquor, they are sustained, the colour of the urine appears more deep, and the consistency thicker: but these being precipitated to the bottom, both the redness and thickness of the liquor are lessened. The reason of this shall be given anon, where we shall speak of the Causes of the Colours, and also of the Clearness and Cloudiness of Urines: we shall now inquire, what is the reason of the difference, that red urines: are wont to be made both in Fevers, and also in the Scurvy, Consumption, and perhaps in severall other distempers.

1. In Fevers, the liquor of the Urine is filled with redness, because of the more plentiful dissolution of the Salt and Sulphur, and their particles copiously boiled in the Serum; for whilst the blood and humors grow hot, from the feverish cause, by reason of the heat being more fully inkinded, the saline and sulphureous little bodies being burnt and torrifed, are more dissolved; and being boiled in the serous Juyce, impart to it a deeper tincture: Even as if the Lye of Ashes be boiled over the fire, it grows more red, than if it were only made by infusion. Also in Fevers, the contents of the urine most often increase its colour, viz. by reason of the intemperance and deflagration of the blood, both the degenerate particles of the nourishing Juyce, and also other matter (as it were the Ashes remaining of the burning of the blood) are burnt together, as it were into a reddish Calx; which being included in the Pores of the urine, renders its colour deep, and afterwards sinking down, makes a sediment like red Oker.

2. In a long Scurvy, the liquor of the Urine grows sometimes so highly red, that it cannot be greater in a burning Fever: if such urine be evaporated, or exposed to distillation, it will shew great plenty of Salt, with a muddy Feces or dreges: wherefore it seems to be manifested, that this deep redness doth chiefly arise from the Salt, (as we have already hinted) by this Experiment; because in Scorbutick people the saline particles, which ought to be made volatile, and so constantly exhaled by transpiration, become fixed, and being hindered from a flux, are heaped together more plentifully in the distempred body. The Salt remaining within, is variously coagulated with Sulphur and Earth, and then is continually dissolved: and from this diverse coagulation and dissolution, the to be admired Symptoms of this Disease are caused, Also from the saline little bodies plentifully dissolved with Tartarous feculencies, and diluted with the Serum, urines are filled with an high redness; to which most often happen in this inveterate disease vices of the Liver and Gall; for when these inwards, being either obstructed or other ways depraved, cannot perform their tasks, for the separating the adust particles of the blood, they being more fully heaped up in the blood, are dissolved in the serous Juyce, and infect it yet with a more lixivial tincture. And if the adust particles of the Sulphur do excel the rest of the fixed and scorbutick Salt, the yellow Jaundice happens together with the Scurvy, and the urine fixes to Linen a Saffrony tincture. But if they be less than they, and that the saline particles excel, the Scorbutick distemper only is produced, in which the urine in intensely red yet does not dye the Linen. I am perswaded that it is thus; because, when I have opened the dead carcasses of many dead of the Scurvy, in whom there was a red urine, I observed that the Liver or Gall was infected: In some the Liver was wholly without blood, and dry like a Cows Udder; in others the bag of the Gall was empty, and nothing in it; in others it was beset with little stones; in others it was filled with filth, not bitter; in all these inwards were so distempred, that the secretion of the Bile was hindered.

3. By reason of this kind of dissolution of the Salt, Urines sometimes grow red in Arthritick diseases; for besides the Gout (in which such Urine is often made) I have observed in some a painful distemper, and as it were like a Fever, caused, with a very high-coloured Urine; they had wandring pains, now in this place, now in that, grievously tormenting, that the sick were scarce able to stand, or to stir their limbs: they were obnoxious to wakings and frequent sweats; they were also troubled much with thirst, and heat of their mouth: and they had a Urine highly red, with a plentiful red sediment. In the mean time it did not appear, either by the Pulse, languishing of the Spirits, or Head-aches, that the blood grew excessively hot, or that they had a Fever. Wherefore I suppose that this kind of distemper doth chiefly consist in the nervous stock, and depends on the exorbitances of the saline Principle, rather than the sulphureous.

4. Also in the confirmed Phthisis or Consumption, especially if an Hectick Fever be joyned with it, there is a red Urine; the reason of which is, if at any time an Ulcer is excited in the Lungs, the putrid filth from thence being mingled with the blood sliding by, causes in it almost a continual effervescency, whereby the sulphureous and saline particles being more plentifully dissolved and boiled in the Serum, affect its liquor with redness: besides, by reason of the blood being defiled after this manner, the nourishing Juyce degenerates almost wholly into putrefaction, by whose recrements the Urine being filled, grows more red, and is very much stuffed with contents: The sign or note of this is, that the sick for the most part grow hot after eating, and that they are troubled with an heat through their whole body, followed with a nightly sweat; besides, their Urines yield a thick and copious sediment, to wit, when the nourishing Juyce, being mixed with the blood, is not assimilated, it stirs up in it a fervour, and being degenerate into an extraneous matter, exhales partly by sweat through the Pores of the skin, and partly being transmitted to the Urine, very much heightens its colour and consistency.

Thus far of a red Urine, whose several species, but now related, have more degrees of intention and remission, accordingly as the causes, altering the colour and consistence in them, are either weaker or stronger.

4. As to what belongs to a green and black Urine, I confess I have never seen those kind of deep colours (exactly like those of Leeks and Ink) in any Urine: but I imagine I may have seen the appearance of a greenish colour from a more deep yellow, and of a blackish Urine from the same with a cloudy and somewhat a dark mixture, and from thence called by Authors a green and black Urine. But those Urines, coloured after that manner, are esteemed either signs of the Jaundice, or of being distempered with some virulency of the blood, if they continue so constantly for some time: or such Urines, as occasion offers, are variously changed, and are now of this or that, and presently of another colour. So I have known Hypochondriacks wont to make such Urines, as it were critically for some time, and then afterwards to render them like sound men. As to the first, when the Jaundice is very great upon them, that the adult portions of Sulphur and Salt remain a long time in the mass of blood, they acquire by a long concoction a fulness of the yellow colour, at first green, and afterwards black, and impart the same to the Serum: For if the yellow Bile, being taken out of the bag of the Gall, and put into a Cucurbit, be exposed to the gentle heat of a Bath, the same in a short time will grow green, and afterwards appear like the blackest Ink: wherefore in the black Jaundice, which is only the yellow carried forth into a worse state, by its long stay or continuance, there is nothing more usual than to make black Urine. Besides, these kind of Urines sometimes appear in a malignant Fever, and in the Plague, also often from drinking of poyson, and in this case it is for the most part a sign of death, because it argues the blood greatly corrupted, and the spirits profligated, and the bond of the mixture loosened, as it were the deadly or mortified distemper: even as were some part of our body, being distempered with an Ulcer, is afterward taken with a Gangrene or mortification, forthwith the flowing corrupt matter, which was at first white, waterish, or yellow, becomes black. Wherefore in the forementioned distempers, when the Urine grows black, the Serum and the blood being wholly vitiated, the skin also is dyed outwardly with such a colour. As to what belongs to Urines periodically tinged with a greenish colour, and especially with black (which happen often to Hypochondriacks) it is most likely, that such arise from the melancholick Feculencies laid up in the Spleen, and from thence, by reason of its congestion, too much flowing forth sometimes, and confused with the blood: for such a matter, being often poured into the Ventricle in some men, stirs up black Vomiting; also in others, the same being supp'd up from the blood passing through, may impart suffusions of the same colours to the serous Juyce.

So much for the Colours of Urines, of which the more pale arise from too much Crudity, almost all the high-coloured, either from the Salt and Sulphur plentifully dissolved, and sometimes from the adult recrements thoroughly boiled in the Serum, or from the more thick contents of the Urine; whether they be the Calx and remaining part of the aliment, degenerated in the concoction, or the wasting or melting of the pining body, or some part of it evilly distempered: what hath been said may be better understood, if the means, whereby these kind of dissolved things or contents are able variously to change the colour of the Urine, be unfolded.

The causes of the diversity of appearances of colours, and their variously changing, as also of the cloudiness and clearness in Urines, (as in all other Liquors) depend only on the various incidence and emersion of the beams of light, as is hinted in another place, in the Tract of Fermentation: For if the substance of the liquor be rare and thin, with open Pores and passages, that the beams of light may easily pass through,

through, it is shining and clear like fountain water : but if the Pores of the liquor be filled with contents; or little bodies swimming in it, so that the luminous beams are broken in their passage, but so that at length they may shew themselves, according to those various manners of refraction and emission, there will appear a Citron, a Saffron, or red colour in a yet clear liquor. If that, in the little spaces of the Pores yet more obstructed, the light cannot pass through, there is a darkness induced : but then if the immersed beams be a little or nothing reflected, the liquor will appear of a brown or dark colour ; but if they are beaten back, according to the diverse manner of reflection, a white, ashy, or some other kind of appearance, is induced. From this being supposed, according as the liquor of the Urine, sometimes almost wholly deprived of Salt and Sulphur, and other things dissolved, easily admits of light, sometimes either very much stuffed, or else moderately with these kind of contents, either distorts the beams falling on them in their passage, or wholly imbibes them, or lastly beats them back ; it were easy to explicate all the Phenomena or appearances of colours and their consistence.

It often happens, that the colour of the same Urine is variously changed : for what is made red, being exposed to the air, becomes white, or of a dark colour, and then after a long time of Citron colour : the reason of which is this, if I am not deceived, this kind of Urine, when it is made, is red, because the Pores of the Liquor are very full of contents ; yet so long as they are dilated with heat, they transmit the rays of light, (although variously distorted) that they may at length shew themselves or appear ; but this Urine is no sooner exposed to the cold, but that the Pores being straitned, the site and position of the parts is changed in the contents, and by that means the passage of the beams of light is hindered : wherefore the liquor presently becomes cloudy, and according as those beams are reflected after this or that manner, a white, or brown, or some other kind of colour is induced : but at length the contents falling down towards the bottom, with their weight, the Pores being freed, transmit again the rays of light, and do not distort them ; wherefore a clear or a Citron colour appears.

From these things which have been spoken concerning the Colours of Urins, may appear what is the cause of the various consistence of Urines. For the particles of Salt and Sulphur, of the adust matter, or nutritious Juyce, depraved in the simulating, are more or less boiled in the Serum, Urines also get their more thin or thick consistency. It remains next that we speak more clearly of the Contents in preternatural Urines, whereof we have often made mention.

CHAP. V.

Of the Contents in the Urines of sick People.

WE suppose the Contents in the Urines of sick people to be twofold, viz. either universal, which proceed from the mass of Blood, and of the nervous Liquor, and respect the habit of the whole Body ; or particular, which are the layings aside or excrements of one bowel, or part ill affected, of which we shall speak anon. Those of the former kind, which come away from the whole, are either natural, viz. Filaments or small threads constituting the Hypostasis or settlement, as in sound Urins ; or preternatural, which chiefly are particles of the nutritious humor degenerate from assimilation, and constitute to more thick bodies of the sediment in Urines ; and lastly to these, (if there be a feverish intemperance) the adust matter of the blood after deflagration, and diluted in the serous Juyce, is added, and increases the bulk of the Contents.

But these Contents, both natural and preternatural, of Urines, represent themselves after a various manner, as the blood more or less unduly grows hot, also as the aliments in the bowels and vessels are variously concocted, and either the superfluities or corruptions of the Chyme, thence made, are washed away with the Serum : for if the nourishable humor transmitted to blood, is not at all perverted, but a great portion of it, laid upon the solid parts, is changed into nourishment, some parts of this also rightly made, being mixed with the Serum, impress yet some marks of an Hypostasis in Urines : Also from the adust or degenerate matter, a preternatural sediment is framed, yet little and thin, neither doth it wholly blot out the appearances of this natural. Wherefore in the beginning and declination of a Fever, sometimes also in a Consumption, or a Cachexy, an Hypostasis, though not so perfect, is perceived. If that the greater portion of the same Chyme, growing hot with the blood, by reason of the immoderate heat, is perverted into an heterogeneous matter, which afterward is sent away with the Serum, as hurtful and unprofitable, presently an obscure and imperfect Hypostasis appears ; and besides it, very many contents are seen in the Urines, which heighten their colour and consistency. Such an Urine, which contains an Hypostasis, though imperfect, together with other things of the same kind dissolved in it, if it be kept in a warm place, the Hypostasis will be perceived alone ; but the rest of the contents, comprehended in the pores of the Urine, dilated by the heat, are made wholly inconspicuous or not to be seen ; yet afterwards the little spaces of the Pores being straitned by cold, the same contents are precipitated, and

and by that means they render the site and position changed, and the Urine troubled and cloudy, and blot out the appearance of the Hypostasis. These kind of Urines in the better state of Fevers in a Catarrh, Cough, difficulty of perspiration, fulness of humors, and in the more light Dyscrasies are wont to be made.

But if in the more grievous state of sickness the Concoction be wholly vitiated, and the whole nutritious Juyce changed into a putrefaction, these kind of contents also may be perceived in the Urine without an Hypostasis, and signifies variously in diseases, after their various ways of being precipitated, and sinking down, and constituting a diverse kind of sediment; to wit, as the separation of the parts succeed soon or late, or not at all; and as the matter falling down shall be little or much, or also of a white, red, or dark colour. I will briefly run through what is most notable and worthy observation concerning this thing.

1. This kind of Urine being full of contents, is not sometimes at all precipitated, (unless the substance of the liquor be dissolved by putrefaction a long time after) but remains a long while troubled and somewhat cloudy, with little bodies swimming through the whole. The reason of this is, either because these contents are too much incocted in the Serum, so that the spirits implanted therein, cannot separate the pure from the impure, the thick from the thin; as may be perceived in brewing Beer, if that the Mault be too much boiled, the liquor shall never grow clear: or else the Urine remains troubled, because it is wholly destitute of spirits, which may compel the parts of the liquor into the motion of Fermentation; as it usually comes to pass in Beer growing sour by reason of Thunder, or of immoderate heat, and being infected with a troubled Feces or Lee, will scarce ever be rightly made clear again. This kind of Urine is perceived for the most part in very dangerous Fevers, and sometimes in a desperate Cachexy, and always portendsevil.

2. Sometimes it happens, that the Urine is so full of contents, that it begins to be troubled whilst it is yet warm. I have often observed it, after this manner, in a slow Fever, whose heat was gentle and more remiss, to wit, in which the particles of the nutritious crassament or substance are depraved, but being a little subdued by heat, or boiled in the Serum, they easily fall out of its pores: as when common Sulphur is boiled in Lye, if that before it be perfectly dissolved, it be taken from the fire, the liquor at first clear and red, by reason of the quick precipitation of the dissolved matter, becomes presently troubled, dark, and of a somewhat whitish colour.

3. But what most usually comes to pass, that this sort of Urine, big with contents, as long as it is hot, and some time after, seems clear and perspicuous, when it grows cold, is wont to be troubled, and as if some Runnet were infused to be precipitated according to all its parts; yet the same, if held near the fire, or in warm water for a little space, shall grow clear again. The reason of this is already fully unfolded, where we spake of the Causes of Cloudiness and of Clearness.

4. After that the Urine being exposed to the cold, is precipitated in this manner, it may be observed by what means its contents descend to the bottom, for sometimes they settle in short a time: and if the liquor grows clear in the space of two or three hours, it is a sign that the liquor of the Urine is not too thick, nor very much filled with Salt and Sulphur: wherefore in the beginning or declination of Fevers, when the heat is slack, such an Urine is most often made: sometimes such a settlement follows not but in the space of many days; the reason of which is, because the consistence of the liquor is thicker than it should be, therefore the contents or dissolved things are not so easily let go from its embrace, that they may fall down to the bottom by their weight. These kind of Urines are wont to be made in the state or height of Fevers, and most often precede an evil Crisis.

5. Of no less a divers kind are the sediments which fall to the bottom. That I may pass over in this place the filthy matter, and blood, sand, gravel, and the like, deposited from some parts, I shall mention those which are the products of the whole body, and they for the most part are either white or brown, or red like Oker: If you strain Urine, when it hath stood long, through brown paper, you may collect these contents. I have often seen a whiteness like Chalk, and sometimes red like Bole Armene, without doubt there is the same matter of all, to wit, the recrements of the deflagrated blood, and of the nutritious juyce depraved in the assimilating: which, as they are burnt by heat in our body, and diversly perverted, appear also in the Urine under a various colour and form; even as Antimony mixed with Nitre, as it is more or less calcined exhibits a Calx, now red, now Saffron colour, now yellow, now brown: The like reason is (as it seems) of the sediments of Urines, which are as it were the Calx of the sulphureous and earthy matter burnt forth by the fire of the Fever in the Viscera and Vessels.

6. Besides these kinds of Contents, which happen in the Urines of sick people, I have often observed, that after the Urine had stood a long while, something was affixed to the sides of the glass like sand, and indeed in divers figures; for now these little bodies like sand grow together with a sharp and unequal superficies, now with ridges like the Crystals of Nitre, and some shine and are pellucid like Ice. I have seen these kind of Crystals fixed to the Urinal, sometimes in the Urines of those troubled with a Dysentery, also in those troubled with pertinacious wakings. Sometimes in Urines, when they have stood long, a certain Cream will swim on the top, as when Tartar is boiled in water: this kind of whitish crust growing together in the superficies of the Urine, is commonly thought to be fat and fattish things, and taken for the melting of the solid parts: wherefore such as are wont to make such an Urine, are presently pronounced to be consumptive, and in a desperate condition: But indeed that is only a saline concretion which,

which if put into the fire, will not melt, but grows hard into a crusty substance. Yea both this and the other consistencies of Urines are as it were the Tartar brought forth in them by a certain Coagulation: But such a Coagulation depends altogether on the particles of the fluid or acetous Salt, combined with others of the fixed or Alcalisate Salt: For in every subject where there is a commixtion of the Salts of either kind, Crystallizations and Coagulations of a diverse manner are caused, either spontaneously by Nature, or may be procured by artificial separation: wherefore this kind of Urine, on which this Cream swims, or that Crystals gather in the sides of the Vessels, indicates the blood to be departed, from its sweet and Balsamick nature (such as depends of the volatile Salt) into an acid and corrosive, by reason of the flux and fixity of the saline Principle. Such an Urine, if it be evaporated, leaves in the bottom of the Vessel great Plenty of Salt: the distempers wherein it is usually found (as I have often observed) are spitting of blood, Atrophy, or general wasting, and the Hypochondriack disposition.

In the Urines of sick people it is worth observation, whether they dye the Urinal or not? For sometimes in Fevers the Urine is no sooner put into the Glass, but presently it darkens its sides with a whitish cloud, and again at another time this does not happen. I suppose that the Glass is dyed, when the liquor of the Urine is fuller of dissolved Sulphur, than its pores can contain within themselves; as may be perceived in Lye, wherein common Sulphur or Antimony is boiled. Also every Urine, if it stand in the Glass till it putrefie, will infect its sides with a crust or cloud, sometimes whitish, sometimes reddish, sometimes of another colour: for the frame of the liquor being loosned by putrefaction, the particles of the Sulphur being loosned from the bond of mixture stick to the Glass: But in the Urines of sick people sometimes this presently follows, because the Sulphur is more copiously dissolved than can be included in its pores.

As to what respects the particular Contents of Urines, they indeed are manifold, and may come from many parts and places: yet they most often depend on diseases implanted about the Reins, Bladder, and Urinary passages: Sometimes it happens by reason of an Imposthume in the Liver, Spleen, Lungs or other Inwards; or by reason of preternatural humours heaped up in those places and flowing out with their fulness, an extraneous matter is transmitted into the mass of blood, and thence into the serous Juyce: but this happens more rarely, because an imposthume being broken within, for the most part pours out its matter into the cavities of the Viscera, from which there is no passage open into the Urinary passages: besides the mass of blood flowing with impurities, does not presently endeavour to send them forth by Urine, but oftener by sweat, spitting, breaking out of Wheals, Tumors, or by other ways of excretion. Wherefore it appears by common observation, that the other contents of Urines (that which we have above cited) are chiefly sent from the Reins and their dependences; the chief of which are sand, stones, blood, matter, bits of flesh, skins, branny or mealy sediments, which for the most part signify either the stony or an ulcerous distemper, or both together, planted beyond the emulgent Vessels.

It is an usual thing for some to void with their water, gravel or small sand of a red colour in great quantity: some of these are obnoxious to the stone in the Reins, and are frequently tormented with Nephritick fits: I have also known others without pain, or other grievous Symptom, for a long time to make a sandy water. All Urines whatsoever, if they stand for some time in a leaded or earthy glazed vessel, affix this kind of red sand to the sides and bottom of the Pot, to wit, the volatile Salt of the Urine is coagulated with the fixed Salt of the Metal: To when Salt Armoniac being mixed with the filings of Steel, Sea-Salt, or Vitriol is sublimated, the elevated flours grow notable red: wherefore it seems that these kind of little sands are begot in the Reins, for that the Salt of the Urine is coagulated with the Tartarous feculencies laid up about the windings of the Reins, from whence the sandy matter is made, which is presently washed away by the serous Juyce passing through: Therefore the gravel that is so frequently made are no small parts or fragments of a greater stone, (as is commonly thought) but extemporary products of the blood and Serum washing the winding passages of the Reins.

By what means little stones are produced in the Bladder or Reins, is not to be fully discoursed in this place: But without doubt it is done rather by Coagulation than Exsiccation or Excalesfaction, by drying or heating. I have observed some sick of the Stone in the Bladder, who after they have made water, were wont to void with great striving and pain a thick and viscous Juyce, which presently hardened into a scaly matter: the smell of this was like Lye, and of such a consistence as Lye evaporated to a thickness, the liquor of which being made thick, presently stiffens into a saline hardness. Lesser stones sometimes pass through the Urinary passages, and are carried out: the greater remain unmoved in their Cells. The places wherein they are usually begotten are the narrow winding bosoms of the Reins, from thence the smaller slide into the Bladder, and if not excerned, they grow into great stones. I once saw many great stones shut up as it were in a Chest about the sides of the Bladder between its Membranes, these without doubt being sent from the Reins while smaller remained in the passages of the Ureters, creeping between the Coats of the Bladder, and there by degrees did increase in bulk. A Matron so distempered long before her death, cast out of the Urinary passage a Membrane thick and broad, full of sandy matter, which (as appeared after her body was opened) was part of the interior Tunick of the Bladder worn and broken by the stones there included.

It is ordinary for Nephritick people, or such as are troubled with the Stone, frequently to void blood or matter with their Urine: for from a greater stone, and endued with sharpness, the flesh of the Reins is easily worn, and the mouths of the Vessels opened, whereby blood flowing out, tinges the Urine; and when a solution of unity is caused in this manner in the Reins, an Ulcer most commonly follows, whereby matter and filthy stuff are poured out with the serous water, and constitute a plentiful and sinking sediment in the Urine: then the sore being more enlarged by the Ulcer, more large profusions of blood often follow, and the flesh it self of the Reins being worn away, and by degrees eaten off, is voided with the Urine. I visited once an ancient Woman, who daily voided with her Urine, for many months, pure blood in great quantity; besides, as often as she made water, she used to void in great quantity pieces of flesh, great gobbets, as it were the little Tubes of the Vessels eaten away, that it was suspected one of her Kidneys was all thus cut away from her body: yet afterwards by a vulnerary Decoction acidulated with Spirit of Vitriol, that bloody water was staid, and this Woman lives still well and in health. I knew another Matron, who used for a long time in making water to void at first blood with a purulent matter, and Membranes: then the bloody water ceasing, for many years she made a waterish Urine with a copious sediment, and white like snot, sinking down to the bottom of the Urinal. Afterwards when she began to want that sediment, a Feverish intemperance followed with pains wandring here and there, with a languishing of strength, and other dangerous Symptoms: and when this sick Woman was brought into danger of her life, a Tumor arising in her left side about her Reins, and ripening into a Boil or Sore, by reason of the large flowing out of the matter, freed her: but yet an hollow and sinuous Ulcer pouring out a thin matter, remained in that place during her life: and being sometimes healed up, would presently break out again. Scarce two years after this Noble Lady having endured the suppression of her Urine for fourteen days, became apopleckick and died. Her body being opened, her left Kidney was quite gone, in the place of it a membranous substance growing to the Loyns, infolding the extremities of the Vessels and Ureter, was grown up: some prints or marks of the Ureter remained, but without any opening into the hollownes of the passage: yea a certain Ichor or serosity dropping out from the little mouths of the emulgent Artery, was carried outwardly into that sinuous Ulcer. The other Kidney was very full of sandy matter and small stones; besides, near the top of the Ureter a stone about the bigness of ones thumb was fixed, whose extremity was so fitted and firmly impacted to the passage or cavity of the Ureter, that it shut it up just like a Tap, and quite hindred the passage of the serous Juyce. The purulent matter comes into the Urine, not only from the Reins, but sometimes out of the Bladder and Urinary passage distempered with an Ulcer; and sometimes also a corrupt seed, or white flux, or menstruous blood are poured into Urines from the Vessels and genital parts, and produce in them preternatural settlements.

4. In the Urines of sick people are often seen abundance of white Contents composed of most small bodies; which, when they are settled, fill up above half the liquor, and make it white and dusky, the rest remaining limpid, and thin in the upper region of the Urinal: this kind of sediment is called Mealy, because it is like water imbued with meal. Concerning this it is doubtfull, whether it proceeds from the whole mass of blood, or only from the Urinary Viscera. It appears by observation, that the same sort of Urine is all ways made in the stone of the Bladder, also sometimes by reason of the Kidney being oppressed with some great stone. I never saw such a settlement in Urines without Nephritick distemper; wherefore I have thought it almost indubitable to be always a sign of the Stone: And it seems that it should wholly depend on the juyce or humour heaped up about the bulk or substance of the stone: For where the stone is fixed in the Kidney or Bladder, the nutritious humour is there perverted from assimilation, and degenerates into a more thick mucor, which uses to be copiously heaped up; like Ichor, which by reason of a Pea put into an Issue, runs out plentifully. But this mucor or filth being washed with Serum, makes that white sediment.

CHAP. VI.

Of Judgments to be given concerning the Urines of sick People.

SO much for the Anatomy of Urines, wherein are unfolded their Elements and constitutive Principles, together with their chief Accidents, viz. Colour, Consistence, and Contents, both what ought naturally to be in them *per essentiam* or essentially, and also what are wont to happen to them preternaturally, by reason of the body being ill affected. It will be easie for any one to accommodate this Hypothesis to practice, and to give Judgment on Urines beholding them in the Urinal; for from what hath been said it appears of what parts the Diseases are made known by the inspection of the Urines, and what the Urine signifies in each of them. Concerning this subject there hath been enough said by Authors; I shall therefore only touch upon it briefly, and lightly pass it over.

Although

Although the matter of Urine, *viz.* the Serum of the blood washes the whole region of the Body; and is circulated with the blood through all the several parts, yet it doth not lay open the condition and diseases of them all, but only of those to which it owes either the natural perfection and genesis of it self, or from which it receives every alteration: wherefore in some respect it shews the action and disposition of the Viscera serving to Concoction, and besides denotes the temper and motion of the blood and humours in the Vessels: but that any one should pretend to know from the Urinal, and to divine a pain in the Head, an Imposthume in the Throat, or any other Disease of any part, from whence nothing is communicated to the Serum, he shews rather his ignorance than the knowledge of any Disease.

Urines brought from sick persons sometimes are wholly like those of sound peoples, and then they give no light to the disease or distempered part; but it may be lawful, having inspected them, to say something negatively, *viz.* that the Patient is free from a Fever, that as to the Ventricle and Concoction of the food, they are indifferently well: wherefore unless he be inclining to a Consumption, or is sick of an Imposthume, or some other disease of the unity being broken; whatsoever it be, the distemper seems not very dangerous or hard to be cured.

But in the mean time I would not have him declare any thing rashly, nor proceed farther than he can with safety return: for I have often observed in some most grievous distempers, *viz.* in a malignant Fever, when with loss of strength, a weak and unequal Pulse, eruption of Spots, and other dangerous Symptoms, the Patients have been desperately sick, that the Urines as to the colour, consistence, and Hypostasis, have been laudable, as in sound persons, so that in such a case the Physician by only viewing the Urine, as to his Prognostication had grievously erred: wherefore there is scarce credit to be given to the single testimony of the Urine, unless there be other signs agreeable; but that it is a lyar in the Plague and malignant Fevers, and deceives: the reason is, that in those diseases the blood is leisurely, and as it were silently corrupted, sometimes without any great fervour: and so, although its liquor be infected by Coagulation, or by mortification or deadness; yet because it doth not burn out much at the same time, so as to make an heap of adust matter, as of Ashes, the Serum is little or nothing altered from its usual disposition or tenour: Besides, sometimes when in such a sickness the blood grows very hot, whatever of excrementitious is heaped up in its mass, is presently transferred to the Brain and nervous stock: wherefore the serous water being free from preternatural contents, remains after its usual manner; besides this case, when the Urines appear of a deep colour, troubled, and without any sediment, there is no reason why the Piss-prophet should make a Prognostication.

As often as the Urines of sick people are unlike those of sound, either something natural is wanting, or what is preternatural is added, or it happens both together.

I. There may be wanting Colour, Consistence, Contents, and Quantity. If the Colour be more remiss than it should, and the Liquor paler, it indicates Crudity, and a defect of making Spirits, to wit, that the nourishing Juyce is not rightly concocted or exalted either in the Viscera or in the Vessels; so that the saline and sulphureous Particles being carried out together, following the distribution as it were the distillation of the Serum, might thoroughly stick to the same, and impart also to it the tincture: wherefore such Urine being viewed from these kind of Symptoms, you may unjustly divine, that there is a weight in the Ventricle, want of Appetite, evil Digestion, a tension in the Hypochondria, an unsuitableness for motion, sleepiness, difficult breathing, and a frequent palpitation of the Heart upon exercise, a pale colour, a swelling of the Feet and Belly, you may say they are in danger of falling (if not already fallen) into a Cachexy or Dropsie, and if it be a Maid, that she is troubled with Longings and the Green-sickness.

If the Colour of Urines be remitted in a Fever without a Crisis, it is a sign that the fermentative matter or adust recrements of the blood are separated from the bosom of the blood, and fixed somewhere, which for the most part happens in the Brain; and for that cause such Urines use to foretel a Delirium or Phrensie; in those troubled with the Stone, a sudden alteration of the urine into a pale and watry colour, denotes the approach of a Fit.

A copious and pale Urine often shews the too great resolution or melting of the Salts, by reason whereof the serosities are sent away as it were in a flood from the whole body, and chiefly from the nervous parts; such an Excretion sometimes is healthful, and as it were critical, when the superfluities happen only to be carried away: sometimes it is symptomatick, and causes a great debility, to wit, because the nutritious Juyce and the good humours are purged out.

If the Consistence be thin, and the Liquor pale, it argues Crudity, want of Spirits, or too much Drinking, or the Nephritick distemper: if it be of a flame-colour, it is a sign of an intermitting Tertian Fever.

If the Contents be wanting, and it be pale, want of Concoction is signified, and a Cachectick distemper of the body. But if it be of a Citron colour, and the consistency mean, without Hypostasis, you may suppose the Patient to have used too much labor or exercise; or to be frequently distempered with Sweats in the night, or perhaps to have an Atrophy, or general wasting, or to be inclining to a Consumption.

If the Urine be continually made in a lesser quantity than it should, unless there be a larger transpiration, it is a sign that the blood is not sufficiently purged from the serous Juyce: wherefore there is a necessity that it become more watry, and that at length a Cachectical disposition of the body, or a Dropic be brought in. But if it be suddenly suppressed, or made with pain and difficulty, it is a sign of the Stone or Gravel.

2. Something is added to the Urine, to wit, when the colour is heightened, and in the mean time the consistency and contents shew themselves in due measure, there may then be a suspicion of a Feverish or Hectical distemper: perhaps some evident cause may precede, as the use of Baths, Heat, Surfeit, or immoderate Exercise, which might have heated the blood; or Cold may have heedlessly been taken, whence may arise a shutting up of the Pores, and difficulty of Perspiration. If the Urine be of a Saffron-colour and tinges the Linen with yellowness, you may say it is the Jaundice: but if it be of a Saffron-colour or red without a Fever, and doth not dye Linen, it shews for the most part the Scurvy or Hypochondriack disposition.

Though the Colour and Hypostasis may be in good order, preternatural Contents are often in the Urine; therefore when it grows cold it is troubled, and makes a sediment sometimes white, and then there is a suspicion of the blood's overflowing with filth, also of an impure Ventricle stuffed with excrementitious matter, or with Worms; sometimes red, which often happens by reason of Transpiration being hindered, a Consumption, and sometimes by reason of a Surfeit, or the beginning of a Fever.

Preternatural and thicker Contents are sometimes in Urines, shewing themselves naturally, which denotes a distemper of some part about the urinary passages; whence Matter, Filth, Blood, the Whites, corrupt Seed, or the like, are mixed with the Urine: and you may easily know by asking how, and in what place the Patient is ill, what part is distempered; and the straining the sediments of those urines will shew what the disease is, and you may be more sure of the nature of the distemper.

When Urines have stood some time, copious white sediments are thence made; it is not easie at first sight to know from whence they come, *viz.* whether from the whole mass of blood, or only from a particular bowell employed for the preparations of the Serum or the Seed. For the impurities of the blood and nervous juyce being deposited under a mealy species in the bottom of the Urinal, are wont to cause a suspicion in the Physician of the Whites in Women, and of the Running of the Reins in Men: such like contents are also seen in Urines, which proceed from the urinary and spermatick parts. Amidst these ambiguities, lest you should guess rashly and confidently by the Urine, and assert uncertain for certain things, and falsehood for truth, the difference of these kind of Urines ought to be indicated after this manner. If the contents be universal, and their signs be to be applied to the mass of blood; for the most part these presently after the making (unless sometimes by chance in a Critical separation) are wholly inconspicuous (as in a thinner substance,) then the Urine being troubled by cold, they descend slowly to the bottom; and being settled, and the Urinal heated, they disappear again. But if these white settlements are sent from a particular nest, they presently disturb and thicken the Urine newly made, are soon precipitated, and vanish not by heat. But that it may appear to what bowell these kind of particular contents should be ascribed, 'tis easily made known to Learned men by other circumstances.

3. The Urine is sometimes wholly altered from the natural state; the colour and contents which should be therein are wanting, and strange things are in their place; then indeed is indicated that there is an intemperance in the whole body, and that the Concoction in the Bowels and Vessels is depraved; you may say the Patient is sick of a Fever; and thence by asking, you may learn and presently pronounce that he is distempered with the Head-ach, Thirst, Heat, queasiness of Stomach, want of sleep, and by consequence with other Symptoms.

It happens sometimes, that the Urine declines from its natural state, yet not to shew the distemper the Patient complains of, but either the cause of the disease, or the consent of some other part with the distempered; as if any one should complain of a cruel Head-ach, or trembling of the Heart, and make a watry Urine, that doth not denote those distempers, but only a crudity in the Ventricle, and some obstructions about the Spleen and Viscera, which may be the cause of those distempers: I say in this case, the Urine being inspected, the chief indications are taken about the Method of Curing, and we must not use Cephalick or Cardiac Remedies, but either Catharticks, which cause Vomit or Purging, or Openers, and especially Calybeats: But the Urine is sometimes vitiated, and yet its signification is wholly a stranger to the distemper the Patient complains of, as if any one were subject to the sleepy disease, or a Lethargy, and makes it red and full of preternatural contents, its inspection suggests chiefly coincinations, *viz.* that we insist not on too hot, but temperate Remedies.

The chief use of Inspection of Urines will be for the observing the state and progress of every disease, as also the alterations towards health or death. For in Chronical diseases, by daily inspecting the Urine, is made known to the Physician, by what degrees the sickness may increase day by day; at what time purging or altering Remedies will be most fit, and what Medicines will be most profitable; hence is to be observed, whether Nature prevails on the disease or not; and a most certain Prognostication may be drawn from hence, either of the hope or danger of health; to wit, according as the signs of Concoction or Crudity appear in the Urines. In acute diseases, hence the state and height of the Fever may be best known, at what time the Crises may be expected, and with what success: when it is best to insist upon Evacuations, and when on Cordials. The Compass is not beheld with more certainty and diligence by

by the Mariner or Steers-man, than the appearances of Urines ought to be observed by the Physician, for fit times and ways of Curing.

These were what I had to say concerning the Judgments of Urine, not collected from the vain Traditions of Quacks, but what are consonant to reason and truth. Besides I know there are ordinarily delivered by Medicaſters and Old women almoſt an innumerable company of Rules and Directions of Urine-divination, that the Urinal is no ſooner inſpected, but they will undertake to divine, whether it be a man or a woman that is ſick, how long they have been ſick, what their diſeaſe is, and whether the diſtemper ſhall end in health or death; whether the Patient, be ſubject to the paſſions of Love or Sadneſs, whether a Woman hath conceived with Child or not, or whether it ſhall be a Boy or a Girl, and an hundred other the like; in which uſing a vain conjecture, they either impoſe by their confidence on the minds of the credulous, or (which is more frequently their cuſtome) by a cunning craftineſs they otherways liſt out the matter by inquiring, and falſly aſcribe it to their knowledge in the inſpection of Urine.

CHAP. VII.

Of the Examination and various ways of proving of Urines.

ALthough the buſineſs of the Examination and Inſpection of Urines ſeems commonly only a ſimple thing (*viz.* the Medicaſters and Quacks for the moſt part behold the Urine ſent in a Glaſs, ſhake it a little, and preſently give Judgment) yet to thoſe who honeſtly endeavour the recovery of the ſick, the matter ſeems a little more intricate, and they uſe to obſerve ſeveral circumſtances concerning Judgment by Urine; which being omitted, nothing indeed can be certainly or directly learnt in the Medicinal Practice from the Urinal. Moreover, in ſome diſeaſes, beſides the mere inſpection of the Glaſs, there are other ways of trial to be had, by which what lies hid in the Urines, and out of ſight, may be made clear: from whence ſome not unprofitably taking care of the ſeparation of Urine more accurately, have uſed to evaporate, diſtill, putrifie, and precipitate them: Wherefore we ſhall ſpeak briefly of the right manner of inſpecting Urine, and in ſome caſes of the Analysis or ſeparation variously to be inſtituted.

When the Urine of the Patient is offered to the Phyſician, if it hath ſtand ſtill for ſome time in the Glaſs, and if the liquor be clear, the Hypoſtaſis is as it were gathered into a little cloud, and if the reſt of the contents ſink down to the bottom, there is nothing more wanting, but that forthwith a prognos tick ſentence may be given. But if the Urine be newly poured into the Urinal, or be troubled by a former ſhaking, you muſt ſtay till the conſuſed parts be ſeparated, and the ſettlement have acquired its due place. If the Liquor be full of contents, and the Pores ſtrained, it becomes troubled and dark, and the Glaſs muſt be put in a warm place, till the Urine grow clear again, and then let it be placed for ſome time near the fire, that whilſt the preternatural or more thin contents are abſorpt by the Pores dilated by the heat, the more thick may fall down to the bottom, and the filaments or little rags making the Hypoſtaſis, (if there be any) may be gathered together below, or in the middle region; for ſo will appear what is the power of Nature, and what of the Diſeaſe. Alſo in Fevers, the degree of heat and efferveſcency, the concoction or depravation of the nutritious Juicy, alſo the congeſtion or heating together of the aduſt matter in the blood, and its ſeparation begun, or wholly fruſtrated, may ſomewhat appear by the ſignification taken from Urines; wherefore you ought to proceed after this manner, when the urine is brought from far, to wit, whoſe Particles are diſturbed by much ſhaking, unleſs it be kept for ſome time in a warm place, they will not eaſily get again their due place of poſition. But if you often viſit any Patient that keeps his bed, it will be convenient, that the urine newly made, and put into an Urinal, be placed near a Stove, where whilſt it grows moderately hot, the ſeveral parts may, after the beſt manner, be diſpoſed to a ſettlement without any trouble or diſturbance.

Afterwards the Urine thus naked, and as it were diſrobed from any covering, is offered to the ſight, the next caution will be, leſt any of its Phenomena or appearances being accidentally contracted, and not properly belonging to it, may impoſe upon the Phyſician; which indeed ſometimes happens, by reaſon of alterations cauſed in them by food taken, and which chiefly conſiſt in the colour and ſmell of Urines, being variously changed beſides Nature, and the expectation of the Phyſician.

For it is an error commonly committed, when the Urine being yellow, and tinging the linen by the taking of Rhubarb, Saffron, Sanders, and the like, undoubtedly to believe it a ſign of the Jaundice; alſo the urine being imbued with blackneſs by the taking of Caſſia, to attribute it to the melancholick Tumor or black Bile; alſo when the urine is deep coloured by taking of Pulſe-broth, or a Decoction of Madder, or other drinks, we falſly ſuppoſe it to indicate a feveriſh intemperance. It often happens from the drinking plentifully thin liquors, the urine is tinctured of its high colour beyond expectation

tion, and heightened by the drinking of strong drink or hotter things: unless the Physician take notice of these kinds of mutations, he will give but a false Judgment concerning Urines by looking on them. When therefore the colour is changed in the Urines without any manifest cause, the manner of living must be inquired into, if that the alteration proceeds from what is eaten or drunk, that it may not be wrongfully ascribed to the disease. A question will here arise, why so far as most things taken in at the mouth, before they go into urine, wholly lose all their colour; which being eaten, so pertinaciously impress a tincture to the Serum, that they pass untouched through all the strait turnings and windings of the passages? The reason or cause of which consists chiefly in this, that some mixtures have the constitutive parts of their colour or dye very subtil, and those highly volatile; wherefore these being taken only in a small quantity, dye the whole mass of the Chyle with their colour; and from thence the nutritious Juice conveyed to the blood, ascends coloured, and its vehicle, viz. the serous Latex, is sent away still dyed or tinctured.

What the odour of Urines of sound people may be, is obvious to every one that can smell, viz. whilst it is fresh made, it is not very ungrateful, by reason of the sulphureous and saline Particles bound up in the substance of the liquor; when it hath stood so long, that the Sulphur begins to exhale, sharpened with the Salt, the mixture being loosened, it putrefies and stinks grievously. Besides we may observe, that sometimes there arises from urines fresh made, a sweet odour like Violets, and sometimes they offend the nose with a very ungrateful stink. The former doth not depend either on an healthful or unhealthful condition of the body, but is produced only from things taken: Turpentine, Nutmeg, and other Gums and Spices taken in at the mouth, though of a diverse nature and operation, impart a like suavity or sweetness to the urine. The reason of this seems to be, because in these kind of mixtures very many particles of the purer Sulphur (that is imbued with Spirits) are eminent; which, for that they are volatile, being confused with the Serum, are not contained in the bond of the mixture; wherefore the urine being made, these alone leap out, and not accompanied with others of the stinking urine, and so diffuse a grateful odour; which, although it proceeds from divers kind of things eaten, yet remains still after the same manner like Violets, for that in all, those sulphureous Particles are set free by digestion from the others joyned with them in the same concrete, nor are infected by different ones from the urine. But as to what respects the stinking urine, that sometimes proceeds from an Ulcer about the Reins, Bladder, or urinary passages; sometimes also it is raised from a too hot intemperance of the Reins, or of the whole Body; for when the Sulphur is deeply boiled in the Serum, its particles being sharpened by the Salines, (for that they are less closely shut up) do presently evaporate, and grievously affect the sense of smelling; but besides, sometimes urines contract a stink from things eaten. For the Balsam of Sulphur, Garlick, Asparagus, Cider, Rhenish Wine, and many other things taken at the mouth, do cause a strong smell in the urine. If the reason of this be demanded, we say that such things which impart a stink to the urine, also provoke it in a more plentiful quantity: wherefore it seems that these sort of things being taken, fuse the blood, and greatly hasten the precipitation of the Serum; and when by this means the serous Juice is pulled away as it were abruptly from the blood, the frame of the liquor is made lax, nor are its parts exactly mixed, nor contained in an equal bond of disposition: wherefore when this urine is made from the body, its frame or substance being before loosened, the particles of the more gross Sulphur (that is combined with Salt) presently breathe out, and so diffuse a stinking smell. For urine thus altered by things taken, seems very like to Lye, wherein Antimony or common Sulphur is boiled, and is afterwards instilled into some acid thing, because in this Decoction, as also in such ruine, the frame of the liquor being unlocked, the little sulphureous bodies leap out, and affect the sensory with a stinking smell.

If that any one more curious in the search of Urines, shall seek further than the examination of the sight and smell, he may easily, by a divers manual operation, resolve them into parts, and as it were dissect them to the life, and thence draw Medicinal directions of no small moment; for that in many Chronical diseases where the Dyscrasies of the blood are more exactly to be sought into, that the proportion and temperature of Salt and Sulphur may be truly found in it, it is sometimes convenient to evaporate urines, or to distil them, something also is to be learned from them, being precipitated, or loosened by putrefaction. I knew an honest Woman greatly afflicted with a scaly filthiness of the skin, which she was wont to scratch off in great plenty, as it were a branny matter. Her urine being evaporated in a little Skillet, left sticking to the sides of the Vessel, a crusty and salt sediment, like the excrement of her skin. Not long since I evaporated the urine of a Gentleman, grievously subject to convulsive motions and painful stretchings out of the Muscles, in the bottom of which there remained a quantity of salt and tartarous matter, exceeding the weight of half the liquor. By this means it will be an easie thing to find the proportion of the saline Principle in the blood and humours: but whether this Salt be volatile, or becomes fixed beyond measure, the distillation of the urine will presently shew; For if the Spirit (so called) be copiously drawn out of the urine, and that besides the Salt ascends into the Alembick, it is a sign of volatilization: but the contrary to this argues the fixity of the Salt.

As the evaporation and distillation of the Urine shew the power of the saline Principle, so the precipitation, putrefaction, and Sulphur lay open the thicker contents of the Urine, as it were in weight and measure. As to the former, although the liquor of the urine be salt, and often big with contents, yet for as much as its saline Particles are not (as it is wont to be in most Menstruums) either wholly in a state of

fixity,

fixity, or of flux, but for the most part volatile, therefore it is not easily nor presently by any salt infusion subject to putrefaction; the Spirit of Vitriol and other acetous things effect nothing: the Salt of Tartar stirs up a little perturbation. But the solution of Alum, for that it greatly constrains, into a little space, presently disturbs the whole liquor extremely, and delivers all the contents of the urines, as they were thrust out of their dens, to be seen openly by the eyes. Wherefore by this means, without any long stay for settlement, you may presently know how much of sulphureous and earthy matter is deposited from the mass of blood for restraints in the bottom.

The putrefaction of Urines is wont to exhibit the several particles of every kind, yet more distinct, and disposed as it were by themselves; for if the urine be left to stand unmoved for many days in the Glass, the colour, odour, and consistency will be very much altered; for the colour will be deeper, the smell ungrateful, and highly stinking; the consistency thicker, and will have on the superficies a downiness or hoariness, sometimes whitish, sometimes bluish, there will be also fixed in the bottom of the Vessel a thick and copious sediment, and often on the sides a sandy or tartareous crust, of a whitish or Ash-colour. From these kind of appearances, and as the urines sooner or later putrify, and so are more or less altered from their former state, it may be conjectured what the proportion of Salt or Sulphur may be, whether of them exceeds the other: also no unfaithful Judgment of the quality and plenty of the earthy matter or the contents may be taken from thence.

And thus, Sir, at length you have the Doctrine or Method of Separation of Urine, such as our unskilfulness hath rendred it: I desire you would be pleased not only to pardon the errors and barrenness of this Discourse, but also to excuse it in other things, because at first writ by your perswasion, and then by your command and request made publick. Wherefore pray take care of this child hardly brought forth and almost an abortive, and as it were exposed and deservedly laid at your door, without portion. Farewel.

Medical and Physical

DISCOURSE

Two

T W O

Physical and Medical EXERCITATIONS,

V I Z.

I. Of the Accension of the Blood.

II. Of Muscular Motion.

THE FIRST

Medical and Physical

DISCOURSE.

Of the growing hot or inkindling of the Blood.

IT is long since I designed to Print my Meditations concerning the remaining Pathology of the Brain and Nervous stock : But when many Diseases of that kind affect the animal Spirits, and not rarely the whole Hypostasis of the corporeal Soul more immediately than the Humors or solid Parts ; I therefore thought it necessary first to publish the Disquisitions of the nature of this Soul, and its manner of subsisting, and also of its Parts and Powers, that from these things rightly known, its preternatural Passions may at length be the better discovered. But concerning these very hard matters, and difficult to be unfolded, when I had begun to frame (as I think) probable and rational Arguments, I saw well they would be looked upon and laughed at by some as unusual things and Paradoxes; which indeed it becomes me not to take ill, but to let every one freely to enjoy his own sense, and to use in all things his own opinion and judgment. Among the many things conjecturally proposed by me, (which I could not avoid) two chief Arguments are opposed, to wit, that I had affirmed, that the blood for the continuing of life was inkindled, and that the animal Spirits, for the motive act, were exploded : which terms, though perhaps they may sound rough and strange to be applied to the animal oeconomy ; yet if any one shall weigh the Reasons and Arguments which do perswade to the truth of either opinion, I doubt not, but that there will be none who will not give their assent, or easily pardon me for mine. In the first place therefore, because there are so many opinions concerning the growing hot of the Blood, for that some attribute it to an innate heat, others to a flame in the Heart, some also to a fermentation of the bloody mass, and others to its inkindling; therefore I shall endeavour more narrowly to introspect the matter, and as much as I am able, to build upon a more certain Ratiocination, its genuine Cause, though very abstruse.

We have formerly discoursed concerning that Soul, which is common to the more perfect Beasts, with that subordinate or more inferiour of Man, and have shewed it to be indeed Corporeal, and to consist of two parts; the one of these rooted in the blood we called a Flame, and the other dwelling in the Brain and nervous stock, Light. As we shall here only treat of the former, I think it will be no difficult matter to make use of the same Reasons and Instances, which truly conclude, or at least very like truth; that in the first place the blood is animate or hath life: Secondly, that this Animation is in its accension or inkindling, or consists in an affection most analogical to this.

1. Not only the opinions of Philosophers, but the undoubted testimony of the Sacred Scripture plainly asserts the animation of the blood: to wit, the use of blood was forbidden in the Mosaical Law, for this reason, because the Blood is the Life or Soul; which is also apparent by the observation of the most famous Harvey, for that its motion is to be observed by the eye, shews that it first lives and last dyes. For the greater proof of this, it is commonly known that Animals only live so long as the blood remains in its due plenty and motion; and that they presently dye, if either too great a quantity of this be taken away, or its motion suppressed.

But as to the second Proposition, to wit, that the life or soul of the fervent blood depends upon its inkindling; this will appear probable, if I shall shew: First, that the liquor of the blood ought to be very hot in the more perfect living Creatures. Secondly, that this growing hot can be produced or conserved in the blood by no other means besides accension or inkindling. Thirdly, that some chief affections, as it were proper passions of fire and flame, are agreeable to the life only of the blood growing hot. Fourthly and lastly, these being clearly shewn, some other less signal accidents and properties, in which common flame and life agree, are added, and also we will unfold how and in what respect they differ among themselves.

As to the first we affirm, that the blood is perpetually moved in all living Creatures; besides in the more perfect it doth estuate or grow hot in act. Indeed its undiscontinued motion is required, both for the conservation of the disposition of the blood it self, whose liquor would otherwise be subject to stagnation and putrefaction, as also that being carried about in the whole body, it might be able to give a due tribute to all parts. For that the offices of the blood, at least in the more perfect living Creatures, are divers and manifold, viz. to insit matter in the Brain and nervous stock for the animal Spirits to dispense the nutritious Juice into all the solid parts, to suggest to the motive parts an elastic Copula, and besides to separate all recrements and worn out Particles, and to put them aside into convenient Emunctories.

But although the meer motion of the Blood in less perfect Animals, or at least its moderate swelling up, such as may be perceived in Wine and other Liquors agitated into Fermentation, is able to sustain and perform the oëconomy of Nature; to wit, for as much as both a crude nutriment is every where received from the river of the blood, though cool, continually flowing into all parts of the whole Body, and that fewer spirits and more thick, as it were separated by percolation or straining, enter the Brain and nervous stock with that plenty, that may suffice for local motion, and the Organs of the few senses to be rudely actuated: yet the blood watering the bodies of more perfect Animals, require offices of a far more excellent kind; for it ought not only to be carried about with a continual and more rapid motion, but very much to swell up, yea actually to grow hot or effervent, to wit, for that end, that its frame or substance being very much loosned, it may more copiously send forth the respective Particles of various kinds, every where falling off from it, and may dispose them here and there for the use and wants of Nature.

But first, for that the animal Spirits are continually to be supplied in great plenty from the mass of blood, and that there is need for the elastic Particles requisite for the locomotive function, to be thence perpetually poured into all the Muscles, it seems very necessary that the liquor from whence these generous and manifold supplements are drawn should be actually hot, or rather should burn forth; to wit, that the aforesaid Particles, not sufficiently to be unlocked but by heat or burning, should freely run out from the substance or frame of the liquor; which truly is manifest, because from Wine, and also from the same bloody Liquor, and all other spirituous things, a subtil and spirituous humour is copiously drawn, but not to be performed by distillation without heat or fire. Yea the sulphureous Particles, although they are less apt to be exhaled from any liquor, yet they most readily fly out by inkindling the subject. By these there is an apparent necessity of the blood's growing hot for the perfection of the animal as well as vital function: but that it may appear by what means this is done, to wit, whether by Accension, or by Fermentation, or by any other way, we shall first in general inquire, by what means, and for what causes any liquid things are wont to grow hot; then we shall consider, to which of these the growing hot of the blood ought to be attributed.

Concerning these we say, that there are only three ways, or so many kinds of causes, by which Liquors conceive a heat, viz. first, by fire or heat being put to them, as when water is made to seeth or boil over the fire, or that it grows hot by the heat of the Sun, a Bath, or Stove, or by the dissolution of quick Lime: instances of all which are commonly known. For the same reason Bath-waters seem to boil. For that we may instance in our own Baths, to wit, they are impregnated neither with Sulphur nor fixed Salt, as I have plainly experimented, by distilling and evaporating them, and by pouring into them precipitating Liquors; yea by dissolving them with Sulphur, and many other ways. They most resemble Lime-water, and they, as we believe, grow hot from a like cause, to wit, by imbibing the fiery little bodies some-

Somewhere hid within the Earth. Of these, unless it had been superfluous, we had here given a fuller description, which may perhaps be done at some other time. Secondly, when saline Corrosives, which are of a diverse kind, being mingled with themselves, or with sulphureous things, work mutually one on another with a great strife and agitation of Particles, and oftentimes excite heat, yea sometimes flame; as when the Spirit and Butter of Antimony are poured to, or mixed with stygian Water, wherein lixivial Salts are melted, or with Oyl of Turpentine, or other distilled things: besides when corrosive Liquors eat Metallick Bodies, they often grow hot. Thirdly, and the only way besides (as I suppose) whereby a liquid thing is made hot, is when any humour, being very much imbued with Sulphur or Spirit, conceives a burning by putting a flame to it, and so grows hot by burning forth. This is ordinarily seen in oily or very spirituous Liquors, being inkindled and inflamed.

There remain indeed some other ways of Calefaction, to wit, Fermentation, Putrefaction, and Attrition, whereby more thick Bodies, or Solids, often conceive a fervour, but they produce not such an effect in Liquids; whilst the mealy Mass or Dough is fermented, the active Particles being stirred up into motion, unfold themselves on every side, and lift up the bulk or substance of the subject; in the mean time, for as much as the sulphureous Particles being agitated with them, take hold one of another, and begin to be combined, a certain heat, though more remiss, is excited; in like manner from Putrefaction, Dung or wet Hay get an heat, to wit, for as much as the sulphureous Particles, within included, are very thickly heaped up together, then being combined together, they break out in troops; yet no Liquors, either thin or thick, whether they ferment or putrifie, do for that reason at any time grow hot; For wines, whilst infermenting they break in pieces the sides of the Tun, or overflow the top of the vessel with a great noise and ebullition, do not actually grow hot, yea not so much as grow warm. The blood being let out of the Body, and placed in convenient Glasses, either to ferment or putrifie, doth not get any actual heat; yet in truth we grant the Blood in living Creatures to be fermented, and by fermenting to be putrified, yea and some other offices of the animal oeconomy to perform the same: moreover, we have formerly shewed from its Fermentation being hindred, or too much increased, or otherwise depraved, divers kinds of diseases to be produced: yet we deny the heat of the blood to be excited by Fermentation. Because neither the blood of more frigid Animals, nor Wines, nor any other Liquors, though agitated with the highest Fermentation, are for that reason actually hot. And indeed the reason seems evident enough, to wit, because the sulphureous Particles being raised up in the more thick subjects, though they lay hold on one another mutually, and being more thickly heaped together, raise up heat: yet in Liquids, the same kind of Particles, however stirred up or agitated, are immediately disjoyned by the watry coming between, and are hindred from their mutual embrace and combination; so that they cannot of themselves produce an actual heat; For the same reason, hard bodies being rubbed one against another, or violently knocked or bruised, do not only produce heat but oftentimes fire; when as yet Liquids, however shaken and agitated, do not grow warm. Therefore as there are only three ways, whereby actual heat may be begotten in all Liquors, we shall inquire to which of these the heat of the Blood may be ascribed.

First, Some say it is the first way, from the opinion both of the Ancients, and of some of the Moderns: the Blood is said to grow hot, by reason of some hot thing put to it, to wit, whilst those affirm an innate heat, and these a little flame to be placed in the Heart, and to heat the blood passing through it; but either of these opinions easily fails, from which it is clear, that the Heart is a mere Muscle, nor doth contain in it self any tinder or matter for a flame or heat (I know not how) implanted, fit for their continuance. For though it be confessed, that on the continual motion of this Bowel, (which is only animal) the Circulation of the Blood doth depend, yet the Heart borrows heat altogether from the blood, and not the blood from the Heart.

Secondly, as to what respects the second way of making hot a liquid thing, to wit, whereby a great heat is excited by the mixing of saline Corrosives together, or also oily, or by corroding a metallick Body, I think there is none that will seriously assert, that the blood grows hot from such a cause; for that its liquor, in its natural state, is always homogeneous, and although it be stuffed with plenty of Salt, it is however with that which is volatile, gentle, and benign only. But there is not to be found, either in the heart or any other place a saline or any otherwise heterogeneous Mine, whereby the bloody liquor, by working or corroding, may get or conceive an heat; to wit, it behoves either such a Mine or the Body to be corroded, to be perpetually renewed, because the ebullition and heat raised up by the strife of Salts, ceases as soon as the Salts are combined, or the Body corroded. If at any time the saline Particles of the humours in our Body depart from their right temper, and become enormous and unbridled, for that reason the blood as to heat and motion, enters into some irregularities; yet it seems impossible, that it should originally and perpetually become hot by the congregation, and strife, or corrosion of the Salts.

Thirdly, As to the third way, whereby Liquids are made hot, though it may seem an uncouth saying, That the blood is so inkindled, yet since we cannot attribute it to any other way besides, what should hinder from attributing its heat to this Cause? And the rather, for that the proper passions of Fire and Flame are agreeable to the life of the Blood alone.

For indeed these three things are chiefly and principally Essentials, requisite for the perpetuating flame, 1. That there be granted to it, as soon as it is inkindled, a free and continued accession of the Air. 2. That it may enjoy a constant sulphureous food. 3. That its recrements both sooty, as also the more thick, be
always

always sent away. So then if I shall shew these things to agree after the same manner with life, as flame, and to those only, without doubt, I think that life it self may be esteemed a certain kind of Flame.

In the first place therefore, that a flame may be inkindled, and remain inkindled, there is need of a free and undiscontinued access of Air, and that not only, that the vaporous Effluvia's, threatening the suffocation of the flame, may be carried away, and always depart, but much rather, that the nitrous food necessarily requisite for the burning of any thing, may be supplied by the Air. For indeed every sublunary fire, and especially flame, is compounded or made up altogether of sulphureous Particles, breaking out in heaps from a combustible Body, and of nitrous Bodies, which every where flow in the Air, meeting with them: when Particles of Sulphur, breaking out slowly or interruptedly, get to themselves a few nitrous, only planted near them, a fire is usually produced, such as is seen in a burning Coal: But when the former going away more impetuously, either of their own accord, or forced by blowing, presently lay hold on very many nitrous Particles flowing round about in the whole circuit, a flame arises. In truth the whole region of the Air is abundantly stuffed with nitrous little bodies, which are every where ready for the constituting of fire and flame, and they being any where inkindled, meet them after the manner of a flood, although not always after the like manner or measure, because it is observed at some times, especially in the Winter-cold, when the Air abounds more in Nitre, that fire or flame doth more ardently burn, and diffuse farther its heat: on the contrary, in rainy weather, as also when the beams of the Sun shine upon the fire, and so dissipate the Nitre of the neighbouring Air, the fire is so dull'd, as is commonly said, that it is extinguished by the Sun. If at any time the nitrous Particles of the Air are excluded from the sulphureous of any subject breaking out in the inkindling or burning, the fire and flame quickly perish; which appears, because this or that being put into a Glass, after the Air is sucked out or excluded, they presently expire. Further, in the open Air, although a naked fire propagates a fire in a fireable matter by mere contact, yet a flame is hardly inkindled without a flame be put to it, or a very strong fire: because, for the stirring up of a flame very many nitrous Particles of the Air, implanted round about, ought to be inkindled at once; as if Nitre and common Sulphur being pounded together, be commixed (because both Incentives agree) even the least spark falling into such a mixture begets an highly impetuous flame, which desiring no farther a nitrous food, is inkindled or burns under water, in a place void of air, or in any place as freely as in the open Air. In like manner, the least sulphureous things, as a bit of ponderous wood, being cast into a red-hot Crucible, in which Nitre is fused, the same at first touch presently conceive a flame, and continue till it be wholly consumed: But that fire and flame being included in a place empty of air, expire by reason of the food of Nitre being drawn away, rather than choaked by their own proper smoke, the Illustrious Mr. Robert Boyle hath most clearly demonstrated by very many Experiments. For a Candle being lighted, and put into a capacious globe of Glass, and the Vessel stopped up: as soon as the air was sucked out by a wind-instrument, the flame did expire. Moreover, he observed, what concludes for our Hypothesis, that the flame contracted it self according to all its dimensions, as soon as ever the Engine began to suck, then after the second or third draught of the drawn forth air, the flame about the utmost extremities appeared very blue, and to go back more and more from the Tallow, till at length getting to the top of the snuff it expired: the same Candle being again lighted, and shut up in the recipient, this worthy Gentleman tryed how long it was able to sustain its light, when the air was not exhausted, and he found it to endure much longer lighted than before. From these it clearly appears, that the flame shut up, expires not so much because it is suffocated by its own proper smoke, as because it is destitute of the nitrous food of the Air. For in the former Experiment the air being exhausted, there was more space for the smoke and fume, that the flame might not be stifled, and yet this dyed sooner, the Recipient being empty, than the same being full of air; besides, the flame dying became bluish, for as much as it is participated of more Sulphur than Nitre; and it left the Tallow, and expired at the top of the snuff, for that it followed its most necessary food as far as it was able, to wit, the nitrous Particles of Air. The same Experiment succeeded alike in live Coals, viz. the naked fire, after the food of Nitre was drawn away, suddenly dyed. Here also it doth what the flame of a Candle doth in Mines or Caves under ground, where the nitrous air is wanting or dispelled, at first it becomes more contracted and blue, and then a little after expires. Exper. Phys. Mec. 50. Exper. 13.

I have been more large in this Argument, because there is for both the like necessity of drawing in of the air, after the same manner, for the sustaining the life of the Blood, and for the continuing of flame. For the more hot Animals, if they are hindered from respiration dye quickly, wherefore the same means of killing is most ready and common to shut up the breath, which being wholly obstructed, life perishes as a flame. If it should be objected, that those choaked do dye, because the soot or smoke being retained, blow up and intumesc the bloody mass, which for that reason, the bulk or substance being increased, and made almost immovable, fills the bosom of the heart, and hinders its motion: I say, that this is improbable, because if the Arteries, every where in the Limbs and about the Neck, be strained hard together with Ligatures, that the blood being straitned as to the compass of its circuit, be very much stopped about the *Precordia*, (more certainly than can happen from the mere retained smoke) yet for that cause death neither presently follows, nor any deadly Symptoms. That this happens in those that are hindered from respiration, because the vital flame of the blood is wanting of the nitrous food of the Air, rather

than overthrown by its proper foot or smoke being detained, the most Famous *Boyl* also by his Experiments hath put it out of doubt: for he hath observed, that hot living Creatures being put *Exper. 41.* within a glassy Globe, and shut up, did far sooner expire, the air being drawn away from them, than the same being left within it, though in the former case, there was more space left for the receiving the smoke, lest the retaining of it might constipate the blood: yet however, if the heat of the Blood should arise from Fermentation, or the congression of dissimilar Particles, or from an ebullition, by reason of admitted heat, or from any other cause besides accension, it is so far that that effect could be inhibited or suppressed by reason of the air being excluded, that on the contrary it would rather for that cause become more strong or intense. For it appears, by a common observation, that Liquors chiefly fermentable, the more strictly they are kept in the Vessel, the more they grow hot, and the air being admitted through some vent-hole, they presently cease from their fury. Moreover, Mr. *Boyl's* Experiments clearly shew, that the effervescencies or growing fervent, stirred up by the ebullition of unlike Particles, or by corrosion, also the boiling up of hot water in a glassie Sphere, are above measure increased after the air is sucked out, *Experiment. Physicom. 41, 42, 43.* That most ingenious Tract of the aforesaid Author supplies us with many Experiments, whereby it is abundantly manifest, that the intestine motions of those Particles, and almost of every thing, besides fire and life, are very much heightened or made strong in the space emptied of air; but their act, presently after the air is withdrawn, is extinguished: hence we may conclude, the life of a living Creature to be either fire, or something analogical to it. The like to these is yet more clearly observed by the diggers of Minerals, who ordinarily experiment in subterranean Caves, where either the Nitre is wanting, or is driven away by some strange damp or vapour, so that they are in danger of being stifled or smothered, at the same time the flame of the Candle is diminished, becomes blue, and at length expires.

The second thing requisite to sustain a flame, is a constant supply of sulphureous food, whereby it may continually be fed, which being subtracted, or by reason of some incongruous mixture depraved, the flame is extinguished; as is perceived in a Lamp, which for want of oyl, or water poured in its place, expires: further, as this sulphureous food is more or less suggested, sometimes more plentifully, sometimes more sparingly, the flame being more or less intense, is sometimes produced clear, sometimes smoaky; in the mean time, the food being constantly consumed by burning, goes away partly into vaporous Effluvia's, and partly into ashes, which are made up of some Particles of Earth, Salt and Sulphur: But it is much otherwise in Liquors exposed to Fermentation, to which if new Particles be continually administered, and the old ones depart, the Fermentation is hindered or disturbed.

In like manner, as in Flame, the blood of the hotter Animals (and this only in all natural things, besides fire) requires a constant and copious sulphureous food; and that being quickly worn, is for the most part consumed in vaporous Effluvia's, a *Caput mortuum* being left of Earth, Salt, and stinking Sulphur: In the mean time from its food consumed by burning, it disposes other Particles for other uses. That the life or flame of the blood doth continually want aliment, there is none but daily finds it in himself: For if that be for some time denied, the vigor of the blood is diminished, yea, and consuming the solid parts, it snatches into its bosom their remnants, and other humours of the Body whereby it may be fed. If the nutriment daily suggested from things taken, be too thin and watry, the fervour of the blood, like flame without food, uses to be remitted; but if the food be very sulphureous and swelling with a vinous Spirit, and plentifully taken in, the blood is presently inflamed, and often breaks out into a Fever, as it were an open burning. In the interim, out of that food of the blood exhausted or consumed, as it seems by accension, hot Effluvia's full of foot and vapour go away, which according to a just account, far exceed all the other excrements of the Body; and that their nature is plainly fiery, the frequent burning of the mouth and tongue, and infecting them with blackness like the foot or smoke of a Chimney, witnesses; besides from the inflamed blood adust Feces, like a *Caput mortuum*, are sent into the Bladder of the Gall, Spleen, and perhaps into other Emunctories.

Thirdly, That inkindled Flame may for some time continue, there is need of continual ventilation, to wit, that its sooty Effluvia's may still fly away, which else being detained and heaped together thereabouts, will suffocate the fire, because by obstructing the Pores of the inflamed Body, they hinder the eruption of the sulphureous matter to be inflamed. Although this condition doth often interfere with the other more potent, *viz.* the necessity of nitrous food to be so drawn in from the Air, that it can scarce be distinguished from it; yet we may plainly perceive, from the detained foot gathered together about the snuff, the light to be put out: for which cause a Lamp, whose wick is made of plumes Alum or other incombustible matter, will not (as it promises) endure any long time, because the foot sticking to the wick, hinders the access of the oyl to the flame; for this reason blasts of wind from the Air wiping away the sootiness, doth not only render the flame more clear, that is free from fume and thick vapour; but food being sufficiently given to it, it becomes more durable.

Even as Flame, the life of the Blood requires also continual ventilation; to which end, besides the greater breathing places of the Breast, innumerable lesser, *viz.* the Pores of the skin gaping every where through the whole Body, do send forth Effluvia's departing plentifully from the boiling blood; which if it happens to be hindered, or too closely shut up, the blood will grow excessively hot, being as it were beset with fume and vapour: besides, there is need to shorten its circuit, that passing through the Lungs with a more frequent turn, it might there, as much as it can, dispel all its foot or smoke.

When

When the Heavens are heated, the Air seems as it were immoveable and to stagnate, we are wont very much to grow hot about the *Precordia*; for that the Blood being fed with a more sparing nitrous food, doth not burn so clearly, but glows with a more suffocating and intrinsick burning: further, for that the Particles of the Air being less nimble, when they are inspired and expired or breathed forth, do not so readily convey away the vaporous Effluvia's of the blood; hence it is, that we fan the Air, that it may be made more moveable, and carry away more quickly and plentifully the foot or smoke from our *Precordia*.

There yet remain some other smaller Considerations of Fire and Flame, respecting indeed not so much the Essence, as the production and extinction of either, which, whether and how far they may agree with the life of the Blood, we shall briefly inquire into.

Fire or Flame is produced two ways, *viz.* either it is kindled from another fire or flame, or begot by an intestine motion of sulphureous Particles. We have largely shewed the Species of either, and the manner of their being made, in our Tract of *Fermentation* (only we omitted there, that the accession of nitrous food was necessary for the sustaining it) even as flame, the life also of the hot or warm Blood, we have observed to be produced by a twofold way, to wit, it is either inkindled from another life or soul, as in Creatures that bring forth alive; or intrinsical Particles predisposed to animation, are at length raised up to life with the blood by a long cherishing of external heat, as in oviparous or egg-laying Creatures.

If it be further demanded, when and how the vital Flame is kindled first in the Blood? I say, some small beginnings of it are laid up from the conception it self in the Genital humour, to wit, when the rudiment of the bodily Soul culled out from the Souls of the Parents, as a little spark stricken from those flames, is hid in a convenient matter; which being from thence raised up by the Mothers heat, begins a little to glow and shine, and afterwards being daily dilated with the blood brought forth, and leisurely increased, is equally extended with the Body, which it actuates and animates. But yet as long as the young one is included in the Egg or Womb, the vital fire, getting very little or scarce any aery food, doth not yet break out into open flame, but like a Brands-end covered over with ashes, burns only slowly and very little, and spreads abroad scarce any heat, wherefore both the formation and increase of the Embryo depends very much on the Mothers heat, or the cherishment of some other analogical thing, whereof being destitute, it perishes: but as soon as the young one is born in due time, and begins to breathe, the vital fire presently receiving the nitrous food, largely unfolds it self, and an heat or effervescency being raised up through the whole bloody mass, it inkindles a certain flame; and because the blood then first rushing into the Lungs, having there gotten an accession of Air, begins to burn, the flesh of that Bow-el, at first reddish, is shortly changed into a whitish colour, like burnt ashes, and the blood it self undergoes a notable alteration; for what did flow of a dark Purple colour into the *Pneumonick* Vessels from the right side of the Heart, returning from thence presently out of the Lungs, becomes Crimson, and as it were of a flame-colour, and so shining, passes through the left Ventricle of the Heart and the appending Arteries.

Indeed that in Creatures new-born, the colour of the Lungs is so suddenly changed, I think it ought to be attributed to the Blood, there at first more openly inkindled, and their flesh as it were somewhat roasted; although the mere inflation of the Lungs in a dead Embryo produces the like effect, because the Membranes of the Lungs and the Parenchyma being distended and increased into a greater capacity, shake off the stagnating blood, and so draw it away into little and scarce to be discerned rivulets.

As to the Colour of the Blood, so variously changed into circulating from a dark purple to a crimson, and from this to that, I say, that the immediate cause of this is, the admixture of the nitrous Air with the Blood; which certainly appears, because the change into a crimson, begins in that place where the Blood chiefly gets the access of the Air, *viz.* whilst it is transferred out of the Arteries into the *Pneumonick* Veins; for in those it appears of a dark Purple, in these every where florid, as the most Learned Doctor *Lower* hath observed. Further, it yet farther appears, that this alteration of the colour proceeds from the admixture of the Air, because that crimson colour follows in the superficies of all blood, let out of the Vessels by reason of its meeting or mingling with air: and if the flowering or top be taken away, another presently arises. Besides, the Blood being let out of a Vein, and very much struck with a switch or rod, it becomes crimson through all: and in like manner the blood of living Creatures shines at first within the *Pneumonick* Veins, to wit, presently after the influx of the Air by the Wind-pipe; and from thence, by reason of the same Particles of inkindled air being yet retained, it passes through all the Arteries still florid; in the mean time, from the Nitre of the Air mingled with the sulphureous Particles, and burning with them, the blood being greatly rarified, and in truth expanded into flame, impetuously swells up within all the passages of the *Pneumonick* Vein and the great Artery, sending from it self copious breaths and hot Effluvia's; but being dilated towards the ends of the Arteries, and returning towards the Heart, that it may enter more closely into the little mouths of the Veins, it lays aside its turgid and burning aery Particles, and being presently made more quiet and half extinct, and so both its vigour and also its colour being changed, it returns through the passages of the Veins that at length running into the Lungs, it might renew its burning. After this manner, that the inkindled blood might flame through the whole Body with a perpetual and equal flame, and successively renew its burning in all its Particles, it ought to be carried about by a perpetual course from the nest of its accension

into all parts, and from these to that. For this end the Machine or Engine of the Heart was needful, as a Pin or Cock, which being made with a double bosom, might receive in it self from the whole Lungs the blood fresh inkindled, that it might presently drive forward, whilst burning, into every part of the whole Body, and might then receive the burnt and half extinguished blood returning from the whole Body; which being imbued with new inflammable juyce, it might deliver to the Lungs to be re-inkindled.

In performing this task, although the Heart be a meer Muscle, and exercised only with an animal motion, seems to serve alone for the Circulation of the Blood; yet in the mean time, it so much helps to moderate the accension of the Blood and its burning, according to the rage of the passions, and to direct other works and uses of the animated body, that we have thought the vital or flamy part of the Soul to have its chief, and as it were Imperial seat in the Heart and Lungs, in every distemper or affection, as of Grief, Joy, Fear, and the like; also in the fits of Diseases, the Heart is disposed after a various manner, and hence it comes to pass, that the blood flowing in fluctuates, and is inkindled with a divers rage; of which there will be a more opportune place of discoursing, when we shall treat of the Passions.

Whilst we consider that the burning of the Blood, and for that reason the vital or flamy part of the Corporeal Soul doth not appear lively or vigorous in all, nor ever after the same manner or measure; yet it exists according to the various constitutions of the blood, to wit, as it is more or less sulphureous, spirituous, saltish, or watry, yea and according to the divers constitutions and conformations both of the food, with which this flame is nourished, as also of the little spiracles or breathing holes, by which it is ventilated; and further, of the Heart it self, whereby it is agitated and driven about here and there; the accension of blood varies also in every one, by means of several other accidents, to wit, as its flame is sometimes great, clear and expanded, sometimes small, contracted or cloudy, sometimes equal and in order, sometimes unequal and often interrupted, yea and it becomes subject to many other mutations; also because the Soul it self having gotten a various nature or disposition, it conceives divers affections and manners, whereof we shall speak hereafter; for as much as it is not a little thing, that the disposition of the whole Soul depends upon the temperament of the bloody mass, and the degree and manner of its accension or inkindling.

It clearly appears, from what hath been said, that Fire and Life do dye or are extinguished alike many ways, to wit, there is an end of either, if the access of nitrous food, or the departure of Effluvia's be hindered, or if the oily or sulphureous aliment, requisite to either, be consumed, too much withdrawn, or perverted from its inflammable disposition; of each whereof it is so clearly apparent, that there needs no farther explication.

Thus far we have shewn, that the Life of the Blood, or that part of the Soul growing therein, is a certain kind of Flame; let us now see by what means it is disposed to burning, and how near it comes to the similitude of a burning Candle or Lamp.

A common Lamp, whether designed to give heat or light, for the most part is wont to be made after this manner; to wit, the Oyl flowing perpetually to the wick, gives continual food to the flame; wherefore as there is but one fire-place or hearth only of light and heat, the action of either is limited only to one place, and so often as there is need of more places at once, or divers parts of the same space or body to be illuminated or made warm, we place here and there divers lighted Candles or Lamps. But if an Instrument made with great artifice (such as is truly an animated Body) with one liquor only contained in it, should be made hot throughout the whole, and to be kept always warm, it ought not only to be lightly inkindled in the wick, but in the whole superficies, and derived by fit Tubes or Pipes to all the parts of the Machine, then the burning liquor ought to enjoy, proportionably to all its parts, an access of nitrous Air, and to lay aside Effluvia's and other recrements, and ought also to have a supply of that constant expence: these kind of offices are not to be performed any where up and down, but only in some set places; therefore the burning liquor ought to be carried about through the whole with a perpetual turn, that all its portions might enjoy successively all those priviledges, and at once heat the whole capacity of the containing Machine, to wit, both the inward and outward recesses. Indeed such a Bannian or Bathing Engine, artificially made, might aptly represent the real Divine handy-work of the Circulation of Blood, and what burns in it, the Life-lamp.

But it may be objected, that the Blood seems not to be inflammable of its own Nature; further, since there is no flame or effervency of this heat to be seen with the eyes, it may well be doubted, whether there be such a thing or no. I say first, That the Chymical Analysis of the Blood shews very many particles of Sulphur and of Spirit, yea a plentiful stock of inflammable Oyl, which are however mixed with other more thick Elements, in a just proportion, to bridle their too great inkindling; to wit, that this liquor might flame out by little and little, and only through fewer parts, for the constituting of a benign and gentle Lamp of life: wherefore the Blood being let out of a Vein upon a burning fire, doth in some measure burn, though it is not like the Spirits of Wine, or Oyl of Turpentine, turning all into a flame; besides, the whole mass of Blood, as the Oyl of a Lamp, ought not to be fired; yea its burning is instituted for that end, that whilst all the Particles of the Mixture being freed, some sulphureous and spirituous are consumed by burning, others more subtil being sent in Troops, might serve for the necessary uses of the animal Regiment; and also others more thick or crass and nourishing, as it were boiled or roasted, might be dispensed for the cherishing all parts; besides, that all the dead, or worn out, and excrementitious may be sent away by fit or convenient sinks, and others constantly substituted in their places by nourishment.

But in the interim, that the vital Flame, which destinated to so many offices, we suppose to be inkindled in the Blood, (otherwise than the common flame, which is plainly conspicuous) appears not at all, a probable reason thereof may be given; as it is most thin, and burns in the Heart, and its depending Vessels as it were shut up in Receptacles, it doth not clearly flame out, but perhaps remains in the form of smoke or a vapour, or breath; yea, although the Blood should openly flame out, yet it might be so done, that its shining being most thin, may not be perceived by our sight, as in the clear light of the day we cannot behold a glowing red-hot Iron, nor shining spark, nor false fires, nor rotten wood, nor many other things shining by night; why then may not the vital fire, even thinner than they, quite escape our sight? Although sometimes hot living Creatures use to send forth a certain fire or flame only conspicuous by night: For we have known in some endued with a hot and vaporous blood, when they have put off their inner garments at night going to bed near a fire or Candle, a very thin and shining flame to have shewn it self, which hath possessed the whole inferior region of the Body. The reason of which affection seems wholly the same, as when the evaporating fume of a Torch just put out, is again inflamed by a light inkindling, and manifestly argues that another flame, the root of this extrinick one, lyes hid within the Body. For this very cause it is, that from the Mains of Horses, and the Skins of Cats, or other hot Animals being shaken, little sparks as it were of fire leap out, and often flames, only conspicuous in the dark arise. Besides, we here take notice in a burning Fever, caused by immoderate drinking of Wine or strong Waters, that the Blood, as the flame of it is, very much increased, doth grow excessively hot, and such are wont to emit dry breaths, and sharp Effluvia's of heat, not like those that proceed from fermenting or boiling Liquor, but only inflamed. That which some in Fevers have imagined to have seen or observed, even burning fires and flame in the eyes, argues indeed that the flame of the blood is very strong, and also that it penetrates the inclosure of the Brain. I knew a certain ingenious Man of a very hot Brain, who affirmed, that after a very plentiful drinking of Wine, he was able in the darkest night to read clearly; from hence also may be collected, how the accension of the blood, like that of burning Liquors, is to be increased or made stronger, viz. by an agitation of the parts, and a more plentiful affusion of sulphureous food.

But that in the hot blood of living Creatures the Properties, Affections, and many other accidents of Fire or Flame are found without the manifest form or species of it; what if we should say the cause to be, for that the vital flame of the Blood is subjugated, or made subordinate to another form, viz. to the corporeal Soul? Wherefore, although it retains the chief qualities and affections of common flame, yet it loses the species of flame or fire; for in every natural mixture, the superiour form exercises a Right and Dominion over all included Particles whatsoever, however fierce and untameable they may be in themselves, and stripping them of their species, ordains and disposes them to peculiar actions in that proper Concrete: when the form of fire excels, that bright burning, that it might propagate largely its ends, destroys and consumes all inflammable objects. But if the form of the corporeal Soul be induced upon the fire, kindled within the blood, it burns forth without fulgor or shining, or destruction of the subject, and is invisible, and as it were subjugated flame, is ordained for the sustaining of life and its offices: but truly the Divine Providence, from the very Creation of the World, hath seemed to have predestinated Forms to natural Bodies, to wit, that they might remain as so many Figures or Types, according to which every Portion of matter framing the Concrete, whether animate or inanimate, might be modified; so that the Mass, according to the virtues of the hidden Seeds, being disposed after this or that manner, happens to have the form of a Stone, a Plant, or Brute, or of any other kind; then the acts and affections, appropriate to such a Species, follow the form it self. When therefore Life or Soul is destinated to these kind of Functions of the more perfect Animals, for the performing of which, the blood, after the manner of burning Liquors, ought to be perpetually hot, and as it were inkindled; what should hinder, but that the act of Life, or of that corporeal Soul (consisting in the motion and agglomeration or heaping together of most subtil and agil Particles) may be called a certain Burning or perpetual Fire of the bloody Mass? Wherein although the accidents and chief qualities of common fire are implanted, yet the form of fire is obscured, as being subjugated to a more noble form, viz. of the corporeal Soul: not much unlike water, which being congealed into Ice or Snow, lays aside the species of water for a time, and may be applied to other uses far distant from fluidity.

But truly, though we affirm, that the corporeal Soul doth stick in the Blood, yet we do not, that it is adequated or limited to it: because whilst the more thick portion of it, as the Roots of some Tree, fixed in the Earth, are sowed in the bloody Mass, the more noble part of the same Soul, as the higher branches, are expanded in the Brain and nervous System; or as we before hinted, when the vital or flaming part of the Soul is contained in the blood, the animal or lucid portion of it is contained in the Head and its Appendix: by which just limit the Sphere of either may be defined, neither may the vital flame impetuously break through the animal Region, the substance of the Brain being more cold, and also shining or bright, is opposed to it, as it were an icy or glassie Bar, whose inferior frame or substance, the small and slender as it were rivers of the Blood, for the sake of cherishing heat can enter: but truly spirituous Particles plentifully flow from its juice or liquor, every where heaped up near the confines of the Brain, and there disposed as it were to be still'd forth, which being immersed in the Brain, and more exalted, affords matter, out of which the animal Spirits are procreated, to be derived through the Nerves into the various Regions of the Body.

THE SECOND

Physical & Medical DISCOURSE

Of Muscular Motion.

AS there are two chief or primary Faculties of the Corporeal Soul, to wit, the Sensitive and Motive, we have assigned certain exterior Powers of either of them, which are chiefly acted in the Nervous stock, and others interior, the Exercises of which lye within the Brain, to wit, such as the Imagination, Memory, Appetite, &c. What we have publickly discoursed of some time since both concerning internal and external Senses, may perhaps hereafter be brought to light and made publick: in the mean time, because I am opposed, concerning both the natural and convulsive Motion, I think it fit at present to publish what I had meditated touching the Motive power, and what Hypothesis I had conceived of so hard and highly intricate a thing.

The motive Faculty of the bodily Soul is wont to be exercised with another kind of Action than the sensitive, viz. with a divers aspect and tendency of animal Spirits. For that every Sense is a certain passion, wherein the Soul, or some portion of it, being outwardly struck, is forced to nod or shake, and a wavering of the Spirits being inwardly made to look back towards the Head; but on the contrary, every Motion is a certain Action wherein the Soul seems to exert it self whole, or part of it self, and by a declination or fluctuation of Spirits being made to bring forth a Systasis, and to extend something as it were its member. Further, whilst the Soul so exerts it self, or some part of it self, that the works then designed might be performed, an heap of animal Spirits being every where disposed in the motive parts, sometimes one, sometimes more are raised up by the Soul, which by that means being expanded with a certain force, and as it were exploded, they blow up the containing bodies, and so the same being increased as to their thickness, and made short as to their length, are made to attract the adjoining member, and stir up local motion.

1. In every motion, these three things ought to be considered: viz. First, the original of the Action, or the first designation of the Motion to be performed, which is always in the Brain or Cerebel. Secondly, its instinct or transmission of the thing begun to the motive parts, which is performed by the commerce of the Spirits lying within the Nerves. Thirdly, the Motive force it self, or exertion of the Spirits implanted in the moving parts, either into a contractive or elastick force. From this threefold Fountain, viz. as the business is performed in every one of these in a various manner, very many kinds and differences of Motions are deduced.

1. As to the original or beginning of Motion, we shall take notice, that that which proceeds from the Brain, with a knowing and auspicious appetite, may be called Spontaneous or Voluntary; but that which is wont to be excited from the Cerebel, where the Law of Nature resides, such as are Respiration, the Pulse, with many others, may be called meerly Natural, or Involuntary: either of these is either direct, which is stirred up of it self, or primarily from this or that beginning, as often as the appetite requires this or that thing, out of a certain proper, and as I may say, intestine deliberation, and chuses out respective motions; so in like manner, when the ordinary offices of the natural and vital Function are performed, according to the solemn Rite of Nature; or the motion of either kind is reflected, to wit, which depending on a previous sense more immediately, as an evident cause or occasion, is presently retorted; so a gentle titillation of the Skin causes a rubbing of it, and the more intense heats of the *Præcordia* stir up the Pulse and Respiration.

2. As to the Vehicle of the Instinct, which we suppose to be wholly done by the Nerves, forasmuch as it is performed by a single Nerve, or by more at once, it is called either a Simple or Complicate Motion; then for that some Nerves help motion more or less than others by sooner or later moving, this or that member is said to be moved first, or by it self, and another by consent: yea, and that consent is wont to be acted or done with neighbouring or more remote parts, and that with a divers respect: But we have in another place largely shewn instances of these kind of sympathetick motions, as also the causes of each of them, and their manner of being made.

3. There

3. There is another, and that a remarkable distinction of Motions, taken from the various constitution of the moving parts : to wit, parts endued with nervous Fibres, and in which the motive Spirits dwell ; either they are Muscles, which perform local Motions ; or membranaceous bodies, the motions of which are terminated in themselves, which therefore we call Intestine. As to what belongs to local motion, of which only we treat at present, although it be confessed by all, that the Brain or Cerebel, and the Nerves and Muscles together one or more, as it were with joyned forces, do contribute to this motion ; also, though it may be sufficiently understood, that the beginning of the motion to be performed is designed in the Brain or Cerebel, and that its instinct is conveyed wholly by the Nerves ; yet by what means the Muscles perform that work, far exceeding any mechanick virtue or operation, seems most hard to be made plain.

That local Motion is performed by traction, and doth depend upon the contraction of a Muscle, is not only a vulgar Opinion, but is also plain by ocular demonstration ; yet it is very much disputed and variously controverted among Authors concerning the manner of Contraction and efficient Cause : some think it enough to say, that the Soul it self, by its presence, doth actuate the Muscle, or contract or draw out here and there its Fibres, as it were a net spread forth. But indeed this is to attribute to the sensitive Soul a supernatural, and as it were Divine virtue. To wit, that the same, by its mere Spirit, was able to bend and force heavy and very great bodies whether it pleases. Further, for what end are the motive Organs framed with wonderful artifice and manifold difference, unless that after the manner of Machines, they might perform their operations by an orderly structure, and as it were mechanical provision of parts ? Truly it will be no hard thing to apply the exercises of a Muscle and of the whole nervous Function, and to explicate them according to the Rules, Canons, and Laws of a Mechanick. Before I enter upon this, I think it not amiss first to speak something of the make, conformation, and use of a Muscle in general. The ancient Anatomists, almost all with one consent, did divide the body of a Muscle into Head, Belly and Tail ; taking for the Head the extremity of the Muscle connexed to the part, to which contraction is made ; for the Tail, the end or portion of the Muscle inserted to the part to be moved ; for the Belly, the part of the Muscle coming between, which is beheld more tumid, with a bulk of flesh ; then for the performing of motion, they did suppose the Muscle to swell up about the Head and Belly, and so to grow short as to its length, and to attract nearer to it self the hanging part ; yet by what means, and for what cause the belly of the Muscle swells up, none yet hath clearly unfolded.

Moreover, although the Doctrine of the Nerves hath been much described by the most skilful Anatomists of every Age, so that the Muscles of the whole Body (as it is thought) have been exactly recounted, and offices assigned them, and monstrous names fitted for the expressing them, yet the true frame of a Muscle, not yet shewed by others, first began to be delivered lately by the most ingenious Doctor Steno. He hath found out in every Muscle two opposite Tendons, into which both the Fibres go ; yea, and hath taught, that the same Fibres wholly, which compose strictly on one side, the Tendon of the knitting being more loosely joyned, do constitute the flesh ; yet so, that some being laid upon others, compose the thickness or profundity of the Muscle, and some laid nigh to others, its breadth or latitude : he calls the former Fibres *Ordines* or Orders, but the other *Versus* or Turnings ; then the parts and composition of a Muscle being after this manner laid open, he aptly reduces its Figures to Mathematical Rules, and according to Canons thence taken, shews the action to be unfolded : because he advertising, that in a Muscle with a simple right line, all the fleshy Fibres, parallel within themselves, and for the most part equal, are carried from one Tendon obliquely into another, and that those Tendons are sowed in the opposite ends or angles of the flesh, whereby he most ingeniously describes a Muscle to be, a Collection of moving Fibres, so framed together, that the middle flesh constitute an oblique angular Parallelopipedum, but the opposite Tendons compose two quadrangular Prisms or Figures. The Instrument which Painters use for the describing many Examples of the same thing, fitly represents the figure of this delineated in a plain : because the styles being fixed to the opposite Angles, express the insertions of the Tendons and the Parallelogram it self the fleshy part of the Muscle : for when the opposite Angles are deduced to a great distance from one another, and made sharper, the two sides come nearer together, and render the Area or middle of the Figure longer, but narrower, a Muscle not contracted is denoted : But if the same Angles are brought nearer, and made more obtuse, the two sides go farther apart, and so make the middle of the Muscle shorter, but also wider, a contracted Muscle seems to be represented. In the mean time, in either site of the aforesaid Parallelogram the quantity or longitude of the sides is not changed, but only their position, and the largeness of the Angles is varied : whether it may be also so in a Muscle, shall hereafter appear. In the mean time, we shall take notice, out of the observation of the most Learned Steno, that a Muscle is either simple, which consists of one belly and two Tendons, of which sort there are many in the Arm and Leg, which are the movers of the fingers and toes, yea and almost every where in other parts of the Body ; or compounded, that hath many bellies, to every one of which, two opposite Tendons are hung ; yet so, as when those compounded Tendons, to wit, two together, shall be joyned, one compound Tendon enters the middle of the flesh, and the other embraces the middle on both parts. This is evidently discerned in the Masseter or Throat-muscle, the Deltoid, and divers others, in all which, even as in a simple Muscle, whilst the fleshy Fibres (to which only the motive power belongs) are contracted, the opposite Angles are enlarged according to the insertions of the Tendons, and so the bellies being made shorter, and at the same time thicker, do swell up.

In a simple Muscle, according as one Tendon or both together, or either by turns, ought to be drawn; besides, according as the part to be drawn is thin, or broad, or planted near or far off, and for several other respects the fleshy belly is diversly formed; and as the *Rhomboides* is its chiefest regular figure, yet that also is sometimes triangular, sometimes trapezial or quadrangular, pyramidal, spiral, semilunar, or like an Half-moon, or of some other irregular form. But in all these kind of Muscles, the fleshy Fibres, according to all their positions, whilst they are contracted, at the same time intumesc or swell up, and are shortned from either end towards the middle, though in all Muscles not always in a like manner and dimension; for if either Tendon be to be drawn at once, the contraction from either fleshy end, is for the most part equal; but at the same time, if one only be drawn from the others that are immoveable, the contraction is made less, and sometimes, *viz.* where the flesh immediately sticks to the bone without any notable Tendon, almost none.

The compounded Muscles are distinguished with a far greater variety; for besides their diversity of figures, all which would be an immense labour to enumerate, according as they are more or less compounded, or have their bellies more or fewer, with a manifold Series stretched out here and there, with Fibres sometimes of the same, sometimes of a divers order, they are very much differenced.

The more thin and less compounded Muscle, when perhaps it is sorted into two or three bellies, disposed in the same being plain, hath the series of fleshy Fibres for the most part looking diversly, all the exterior Tendons embracing one end of the Muscle, and hath the others intermediate or that come between immersed about the other end; so that the several fleshy Fibres of every Belly lye parallel between the one extreme Tendon and the other intermediate Tendon. The thicker and more compounded Muscle, that it might perform at once quick, hard, and long motions, hath many bellies planted in divers plains, and the series of fleshy Fibres (which are all short) looking many ways. The frame of them, although it be very intricate, that one can scarce number all the bellies, much less observe their habitudes, mutual dependences, and means of connexions among themselves; yet they may in some sort be reduced to this common Rule in most, to wit, in the great compounded Muscles, such as are those round ones which contribute mighty strength and elastick force to the middle of the Arms and Legs, we may take notice, in one end of two vast exterior Tendons covering almost the whole superficies of the Muscle, which being divided presently into many fissures or clefts, are stretched out between a broad shoot or claw to the other extremity of the Muscle; then on the opposite side, about this other end, a great Tendon enters the middle of the flesh, which also is cleft or divided presently into many laps, distributed through the whole interior belly of the Muscle. And as these interior lamens or laps meeting with the exterior, and being stretched out almost to the opposite end, look many ways, and have their superficies turning on every side, some every where are destinated to others opposite, and are committed or sent through the intervenient series of the fleshy Fibres: such a Muscle, whose very many bellies being planted in divers plains, do look many ways, can by no manner or way be cleft or pulled asunder, but that the other series of fleshy Fibres must be broke asunder in the midst. The bellies of a Muscle, so very much compounded, although manifold, yet are very slender, so that the fleshy Fibres thereof being most short, and having their Angles always equal, but oblique, with the tendinous laps, for that cause make a most strong attraction. Because the numerous series of fleshy Fibres seem as it were so many distinct posts or supporters set together for the moving of any weight, or rather, for that either great Tendon is presently so cut into many lappets, it is like, as if a mighty draw-rope, hung for the drawing up a body, should be presently divided into many little ropes or cords, by which many men might draw at once. For whilst the several series of the fleshy Fibres are shortned at once, they draw the opposite Angles of all the tendinous lappets together, and so the belly of the whole Muscle being intumefied or swelled up, they strongly draw either end, or that which is moveable towards the middle.

On every Muscle, both simple and compound, there is stretched on every side a membranaceous covering; besides, other little Fibres traverse, to wit, membranaceous, are woven between the direct moving fleshy Fibres of every one, which clothe each of them, and keep or fasten them together, yea (as it seems probable) they both communicate to all the fleshy Fibres the same instinct of obeying the motion, and also carry to the Tendons, the troops of the inflowing Spirits, received from the Nerve.

The Arteries and Veins, inserted in the middle of every Muscle, send forth little branches on all sides, obliquely cutting the moving Fibres, from which lesser branches dispersed between the *Interstitia* of the flesh, water them all with a flux or reflux of the blood. But the Nerve entering the fleshy belly of every one, distributes some smaller circles only in the neighbouring parts, as it were bearing only the Symbol or mark of the commanded action, commands the execution of it to the Guard or inferior Company of the fleshy Fibres and membranaceous Fibrils.

I had designed Figures, almost of every kind of Muscles, to be engraved according to the natural appearances: but the Printer making haste, I had not the opportunity to dissect an humane Body, having only taken some few Muscles from the Leg of an Ox, we have caused them to be delineated to the life, which are to be seen at the end, although the famous *Steno* hath already accurately performed this task. Which Figures, if any one think too much bending to Mathematical Rules, he may with an easie labour behold the same Conformation of a Muscle, as he hath described it in the flesh it self. For if a simple regular Muscle be cut out of any Animal, and so placed, that the Tendons here and there be held on the sides, the fleshy Fibres between them intercepted in oblique and equal Angles, be pressed upon an Horizontal

tal plain, the flesh will be exactly like a Rhomboides or an oblique angular Parallelopipedum. Then if the site of the same Muscle being changed, and its Tendons placed above and below; you shall cut long ways the inferior Tendon, and pull the parts one from another, and divide by tearing the whole Muscle into two parts, you shall presently see a most elegant spectacle, all the fleshy Fibres disposed in one series, yea and parallel between themselves, and of the same longitude, to proceed from one Tendon into another; and to make both Angles always oblique and equal; although we cannot cleave after this manner the compounded Muscles, whose manifold bellies have a diverse plain, yet it will easily appear, to one curiously cutting them, either raw or boiled, two Tendons to be fitted to each Parallelogram of the flesh.

As to what respects the action of a Muscle, we plainly saw in dissected living Creatures, (which only shew this) that it is contracted, yet not so as the old Opinion declared, to wit, that the Fibres being contracted from the end towards the beginning, one extremity of the Muscle was carried towards the other; but the fleshy Fibres only and their ends are seen to be contracted towards the middle, the Tendons being still unchanged and altered neither as to their longitude or thickness: which thing also the most Learned *Steno* did first of all observe long since. This is clearly perceived in the Diaphragma and the Muscles dedicated for Respiration, which are moved with a constant change: for as often as the Muscle is contracted, you may behold all the fleshy Fibres, in either extremity, to be pulled together at once, and as if they would enter on either side one another to be carried nearer, and so at once to become shorter and thicker, then from that constriction to return loose to their wonted longitude and slenderness. Whilst you behold this to be so done, you will easily think, that something, to wit, spirit or subtil matter doth flow from the Tendons into the flesh or fleshy Fibres, which entering them on either side, blows them up, and at the same time draws them together nearer within themselves, that presently all the Fibres are made shorter and intumefied; then when that matter recedes from the flesh or fleshy Fibres into the Tendons, the Fibres being emptied and loosened from their corrugation or wrinkling, are restored to their former longitude, and so by turns: whether this in truth be so done or no, shall be discoursed upon.

In the meantime, that we may proceed to other appearances of Musculary Motion, if that the Membrane of the Muscle being drawn away, you shall separate some fleshy Fibres from others by cutting the little fibrils, whereby they are joyned, and loosen them quite, you will see them so singular and free, to be wrinkled or drawn together in every motion like the others compacted together.

Further, I advertise you, that these Fibres so loosened and freed, some cut off in one end, and separated from the Tendon, did yet contract themselves to the motion of the Muscle, together with the other Fibres, about the other whole end, without that cut off in the mean time growing flaggy or loose. After this I divided with a pair of Scissers, a certain fleshy portion of the thinner Muscle, in three or four pieces transverse, the bigness of an inch: which being done, the portions cut off in either end, only entered into, for a short space, some light and inordinate corrugations, and presently became immoveable. The other extreme portions of the Muscle so cut, sticking to the Tendons, continued to be much more lively and longer contracted, but irregularly and convulsively, to wit, with a certain intortion of the Fibres. Truly, in the Fibres so cut off, some small footsteps of contraction did remain for a little while, partly by reason of the Instinct of Motion delivered through the membranaceous fibrils, by which they did yet cohere with the whole flesh, and partly because the animal Spirits, implanted in the fleshy Fibres, now divided from the rest, and left without influence, did exert or put forth their utmost contractive endeavours after the usual manner. For this reason sometimes in the Heart taken out, and in a piece of it cut off with a Sword, as also in other Muscles, after the Nerves and sanguiferous Vessels are cut off, a contraction and relaxation continue for some time. The other Fibres cut off only by reason of the access and recess of the Spirits from the Tendons were able still in some measure to be contracted and relaxed.

When in the Diaphragma I had freed many singular Fibres from the knittings of others, I tried what Ligatures put in several places of them might effect. Some of them then being bound about the middle, were contracted even as the whole fibres, but with some little swelling about the Ligature. When I had bound others about the ends, where they cohere to the Tendons, now one, then another, the motion was chiefly and almost only continued about the free end. Further, in the fibres bound at both ends at once, the contraction wholly ceased.

Contraction and Relaxation are not only seen, and indeed probable, in the Heart, but in the Diaphragma and other Muscles appointed for Respiration, which use to be performed in all, acting vicissively, according to the Instincts of Nature, and for the most part equally (though there are not the like intervals of motions in all) yea, and the Muscles serving to the voluntary function, enter oftentimes into spontaneous Contractions, unless they be hindered by their Antagonists, as it appears, for that the Spasm or Cramp of one Muscle comes upon the Palsie of another. Contraction and Relaxation are iterated more swiftly in the Heart, than in the Muscles of Respiration, and so perhaps in these, than in several others. In those ready to dye, the fleshy Pannicle every where trembling, clearly shews their changes by innumerable beatings or leapings.

As to what respects the Humors, whereby all the fibres of a Muscle, viz. the fleshy, tendinous, and membranaceous, and what lies between them, seem to be watered, filled, or blown up, we ought to take notice of them, at least two of them, (to wit, the bloody and nervous liquor) if not more. And in the first

place it is clearly manifest to the sense, that the blood doth wash all the fleshy and membranaceous fibres which are interwoven with these : because, if the Spirit of Wine, tinged with Ink, be put into an Artery belonging to any Muscle, the Vein in the mean time being tyed close, the superficies of all the fleshy fibres and transverse fibrils are dyed with blackness, the Tendons being then scarcely at all changed in their colour ; it appears from hence, that the blood doth every where outwardly water all the flesh or fleshy Fibres, and only those. We have not yet found by any certain mark, whether the blood enters more deeply the fleshy fibres, or insils into them the subtil liquor falling from them, although this last seems most probable ; but indeed we affirm, that all the fibres, viz. the fleshy, tendinous, and membranaceous, are perpetually and plentifully actuated by the implanted and inflowing animal Spirits, and constantly imbued with the nervous liquor, which is the Vehicle of the Spirits. But how far, or how much the aforesaid humors conduce to the exercise of the animal Faculties, doth not easily appear ; but because the animal Spirits cannot consist without the nervous liquor, and depend very much upon its disposition, we may conclude, that it doth serve something to the actuating the motive power ; for that reason also, that the continual afflux of the blood is nevertheless necessary, an Experiment cited by the Ingenious *Steno*, and proved of late by others, plainly confirms. He hath observed, that in a living Dog, the descending great Artery being tyed without any previous cutting off, the voluntary motion of all the posterior parts have ceased, as often as he tyed the string, and as often returned again as he loosed the knot.

These are the chief Phenomena to be observed concerning the frame and action of a Muscle in the dissection of Animals, both of such as were living, as also of the dead and dying. From which, however placed together and compared among themselves, how difficult a thing it is to constitute the Aetiology of the animal motive faculty, appears even from hence, that the most Ingenious *Steno*, after he had very accurately delivered the Elements of his Myology, by himself first invented, nevertheless he wholly avoided that Hypothesis which might be founded out of them ; for that he yet doubted, whether the explication of a Muscle by a Rectangle were convenient to the Nature in all, wherefore when many run to the manner of muscular Contraction, by the repletion of the fibres, and others from their inanition, and some to both, he ingenuously professes, that the true causes of this thing do not clearly appear to him.

And as to this abstruse matter, although I do not believe that I am able to bring to light, or shew any thing more certainly than others ; yet as in mechanical things, when any one would observe the motions of a Clock or Engine, he takes the Machine it self to pieces to consider the singular artifice, and doth not doubt but he will learn the causes and properties of the Phenomenon, if not all, at least the chief : In like manner, when it is brought before your eyes to behold and consider the structure and parts of a Muscle, the conformations of the moving fibres, their gists and alterations whilst they are in motion, why is it that we should despair to extricate the means or reasons of the motive function, either by truths or by what is next to truth ? Wherefore I think it may be lawful for me here to bring before you our conceptions and notions concerning this thing, indeed not rashly taken, or to comply with our former Hypothesis, or to oppose any other ; which if they shall not satisfy all, may at least excite others to find out better.

But we shall here repeat what we have mentioned before, viz. that the power or virtue by which a Muscle is moved, proceeds from the Brain, is conveyed through the Nerves, and is performed by the fleshy fibres contracted, and by that means abbreviated. This latter is proved by ocular demonstration, yea it appears by it, that the motive force doth depend also upon those former, and is so transferred by a long passage, that the influence of the Spirits being suppressed in their beginning, or intercepted in the way, for that reason the exercise of the designed motion may be hindered. Further we notice, that the motive force is far greater in the Muscle, or in the end, than in the beginning or middle : because the Brain and depending Nerves are made of a tender and fragil substance, and can pull or draw nothing strongly ; but the Muscle putting forth strongly its contractive force, seems almost to be equal to the strength of a Post or Crow, or of a Pulley or Windlass. Sometimes the local motion is a compound Action to be performed of many Organs, which consist in divers places, and as its virtue is far more strong in the end than in the beginning or way, we will inquire by what means, as it were mechanical, the motive force may be so augmented or multiplied in its progress, then what is brought to the motion from several Organs.

As to the first, in Artificial things, when for the facilitating of motion, and the increasing the moving force, many Instruments are invented, all of them, or at least the chief, may be reduced to these two Heads, viz. first, either the same force or impression may be continued, without the addition of any new force, from one term or end to the other, or from the first mover to the thing moved, which notwithstanding may be much increased in the way, as the Centers of Gravity are farther off or multiplied ; for the farther the motion is begun from the first Center of Gravity, the stronger it proceeds, as is beheld in a Crow or Leaver, and in other things reducible to a Leaver. Then if other things be disposed beyond the first Center of Gravity successively before the end of the motion, as in a circular Wheel, the same motive force is wont to be increased very much. But to this there is required, that the instruments of motion be sufficiently strong and tenacious in their whole tract ; for otherwise the motive force being increased, the same breaking falls down before the designed action be performed. Secondly, there is another way of multiplying the motive force to a great degree, and also at a great distance, which is performed with the addition of new forces or of fresh supplies, to wit, when the elastick Particles, or those making the force, being disposed and shut up in private places, as it were little Cells, afterwards, as occasion serves, are

are sent forth by a light contact or blast of a remote Agent, into the liberty of motion, which they readily perform. By this means, Air compacted and shut up, when it is permitted to get out, impetuously forcing a Bullet or other subject, sends or drives it out a great way. It is sufficiently known what mighty and often horrid forces Gun-powder yields about the end of the Explosion, when in the beginning or first inkindling, the force being transmitted through the fiery fume, as yet weak, might be restrained by a light impression of the hand. There are also other explosive little bodies of a various kind, which being hid in convenient Boxes or Cells, when they are raised up into motion by an inkindling, or irritament, or provocative, do often exert an incredible force. It behoves us then to inquire from which of these ways it comes to pass, that the motive force doth in the Muscles so far exceed the force transmitted from the Brain through the Nerves, or whether the action of a Musculary Motion be merely contractive, or rather elastick, or in some measure explosive?

Concerning these things it manifestly appears, that the Muscles do draw, to wit, being abbreviated, do bring the Tendon with the hanging part towards it self. Further, for as much as there is need for the officers of traction to be sometimes more strongly, sometimes more weakly performed by them, so to have the Centers of Gravity now higher, now farther off planted from the beginning of the motion; hence the Muscles which extend or bend the Thigh, especially the *Psoæ* and *Glutia* (great Muscles beginning in the Breast, and reaching into the Thigh) do hide their fleshy moving fibres deeply within the Trunk of the Body: but those which turn about the Thigh are constituted either near the hole or the rising of the Bone of the Thigh, or somewhere thereabout; in like manner it is observed in all the rest of the members, that the belly of the Muscle gets a more remote or nearer site from the article or hinge of motion, as it designed for performing either a stronger or weaker motion; But truly this doth not hold as to the other moving parts, to wit, the Brain and Nerves, which cooperate with the Muscles in the motive Act; because, although the motive force is carried by a long passage through all these Organs, yet it seems impossible, that a contraction so strongly performed by a Muscle, should be begun by the tender and immoveable Brain, and continued through the small and fragil Nerves, but that it must necessarily be supposed some motive Particles are hid in the Muscle, which, as occasion is given, are stirred up according to the Instinct, delivered by the Nerves from the Brain, into motion, as it were with a certain explosion. But what these Particles may be, by what means they are instigated into motion, and how they induce the contraction of a Muscle, seems most difficult to be unfolded.

Truly it may be lawfully concluded from the effect, that elastick Particles, and fit to move themselves, are contained in the Muscles, and hid every where within the fibres, because the Anatomy of living Creatures discovers often a motion in a separated Muscle, yea in its fibres divided one from another. The Hearts of some Animals beat a long while being pulled out of the Body, the Muscles cut off, sometimes perform the motions of contraction. In great labouring Beasts slain or dying, although the Heart and the Brain be taken out, the fleshy Pannicle performs for some time very many turns of contractions and relaxations. From these it is manifestly clear, that there are among the Particles of the Muscles agil and self forcers, or carried by their own force heaped together, which, although the animal oeconomy be very much disturbed or overthrown, do enter into motion of their own accord, yet in a tranquil estate they perform no actions, unless commanded by the Brain or Cerebel, and delivered by the Nerves.

Whilst a Muscle is contracted, the cutting up of a live Creature shews only the fleshy fibres to run into motion by themselves, to wit, being made more tumid, sharper, and shorter at the same time, to amplify or enlarge the belly of the Muscle, and in the interim, the Tendons, as if immoveable of themselves, to wit, not altered either as to their thickness or length, only pulled as it were by the fleshy fibres, to be moved, and to draw with them the moved part; whence it seems to be manifest, that the animal Spirits or elastick Particles, whichsoever they are, whilst they perform the Musculary Motion, are only or chiefly agitated among the fleshy fibres. Further, hence any one may strongly think, that such Particles are not at all contained, or are wholly idle in the tendinous fibres; for as we have noted, that the Tendon is not changed in the act, we may lawfully suspect, that it is only instead of a Crook, by which means the fleshy fibres being contracted, may draw the member to be moved at a distance from them towards themselves.

But indeed it sufficiently appears by evident signs, that the animal Spirits or elastick Particles do lodge within the Tendinous fibres, and truly much more plentifully than in the fleshy: First, the sense shews this, to wit, the touch, which is much sharper and far more sensible in the Tendon than in the flesh: yea any irritation or breach of the unity happening in that part, brings not only a most troublesome sense, to wit, a very cruel pain, but besides, is wont to excite in the neighbouring flesh a Tumor or Swelling, and frequently most grievous Convulsions; whence we necessarily conclude, that the animal Spirits do inhabit the tendinous fibres in great abundance: but what they do there, and by what means they serve to the motive function, we will next inquire.

As often as the motion of a living Muscle was beheld by me, I considered and weighed in my mind by what means all the fleshy fibres were contracted and released by turns, I could conceive or collect no other thing than that in every contraction, the Spirits or certain elastick Particles did rush into the fleshy fibres from either Tendon, and did intumesc and force them nearer towards themselves or together; then the same Particles presently coming back from the flesh into the Tendons, the relaxation of the Muscles happened. In a bare or naked Muscle, when I had separated every fleshy fibre or a company of them apart

from the rest in the whole passage by help of a Microscope, I most plainly perceive the Tumor, begun at either end of the flesh, to be carried towards the middle, as it were by the Spirits, entered here and there at once. Further (which I mentioned before) each fibre being tyed about the middle, being as it were as yet free and compacted with the others, was contracted or drawn together; but a Ligature being put to both ends, is remained flabby constantly above or beyond the bound place. But that I might no longer doubt concerning this, I applied two Ligatures, at equal distances from the middle and the ends, about the same bundle of fleshy fibres, which being done, a contraction and swelling up arising presently from either fleshy extreme to the places bound, went no farther; the middle part between in the mean time being unmoved, remained flaccid; whence it may be well concluded, that in every muscular contraction the animal Spirits or elastick Particles do leap out from the tendinous fibres into the fleshy, and vicissively in the relaxation, recede or run back from these into those.

However this being proved and granted, there yet remain very many difficulties concerning Muscular Motion; for first, it may be asked how the animal Spirits, which enter silently, or without any incitation, or Tumor, the tendinous fibres do so blow up the fleshy fibres, that they are able to force them altogether into shorter spaces.

For the producing this effect, plenty of Spirits leaping from the tendinous fibres, do not seem alone sufficient; but besides, we may suppose some other kind of Particles, implanted in the fleshy fibres, meeting with the others flowing from the Tendons, do forthwith strive, whence a mutual rarefaction, and turgescency or swelling up of them, or an inflation or sudden blowing up of the containing bodies, together with an abbreviation or shortning of them, doth arise; not much unlike, as when the Corpuscles or little bodies of fire entering into a piece of leather, or any thing, and forcing variously here and there its implanted Particles (whereby they are presently insnared) make it so to be stuffed and wrinkled; in like manner also the animal Spirits, although they pass through the Tendons, where they are solitary or by themselves, without moving them (as the Effluvia's of heat in Metals or more dry bodies) yet being dilated in the flesh, for that there joyning with elastick Particles of another kind, they are expanded or stretched out, they cause the sudden inflations and corrugations of the containing fibres. But we have elsewhere shewn, that such Particles divers and wholly heterogene to the nature of the Spirits, may be copiously and easily carried to the Muscles. For indeed it is plain by ocular demonstration, that the blood doth every where wash and water outwardly all the fleshy fibres, which besides, it is thought not only to nourish, but also to be busied about the offices of the animal Function: and what can be less suspected, than that it doth insil into their Pipes a certain subtil liquor, whose Particles being agitated, and also rarified by the Spirits flowing therein, stuff up the fibres, (as we but now hinted) and compel them intumescid, by reason of the assault on either side made, into shorter spaces.

But that the fleshy belly of the Muscle, whilst it is contracted, doth swell up, is not at all to be doubted, because this is evidently beheld by the sight and touch in the dissection of living Creatures: to wit, all the fleshy fibres being wrinkled together, are made more tumid and sharper, and so shorten the Muscle, and make it also thicker and broader: For the more certain belief of this, when I had bound some of the fleshy fibres, separated from the knitting of the rest, and had left others near them loose, there appeared a notable difference between those flaccid or not swelled, and these intumescid or swelled up in every contraction of the Muscle.

But if it be demanded, of what nature, to wit, whether spirituous saline, as may be believed, or of any other disposition, the animal Spirits, derived from the Brain into the Muscles, may be; and then whether the other Latex, immediately carried to them from the blood, is sulphureous or nitrous. Concerning these, because it appears not to the sense, we shall pronounce nothing rashly or positively. But even as in other natural things, the active Particles of a various kind, which being unlike among themselves, are found apt mutually to grow hot, or to be struck off from one another, otherwise to be rarified or expanded; and as the intestine motions of Bodies, and especially the elastick, such as are the contractions of the Muscles, can only proceed from the congressions of such like, certainly it may be lawful to presume, that these do wholly depend upon such a cause.

Therefore as to the Muscular Motion in general, we shall conclude after this manner, with a sufficiently probable conjecture, viz. that the animal Spirits being brought from the Head by the passage of the Nerves to every Muscle, (and as it is very likely) received from the membranaceous fibrils, are carried by their passage into the tendinous fibres, and there they are plentifully laid up as in fit Store-houses; which Spirits, as they are naturally nimble and elastick, where ever they may, and are permitted, expanding themselves, leap into the fleshy fibres; then the force being finished, presently sinking down, they slide back into the Tendons, and so vicissively. But whilst the same animal Spirits, at the instinct given for the performing of motion, do leap out of the tendinous fibres into the fleshy, they meet there with active Particles of another nature, supplied from the blood, and presently they grow mutually hot; so that by the strife and agitation of both, the fleshy fibres, for that they are lax and porous, are stuffed up and driven into wrinklins, from all which being at once wrinkled or shrivell'd up, the contraction of the whole Muscle proceeds; the contraction being finished, the sincere or clear Spirits, which reside or are asswaged, go back for the most part into the tendinous fibres, the other Particles being left within the flesh; the loss or wasting of these the blood supplies, as the Nerves do those. By what instinct the muscular contraction begins and ends, shall be inquired into presently.

That the animal Spirits, flowing from the tendinous Fibres, may enter equally all the fleshy, there are two Tendons in every simple Muscle, which are so constituted, according to opposite Angles, that the Spirits running to them from a twofold starting place or bound, might presently fill the whole belly of the Muscle, and that motion being finished, might immediately swiftly retire. If the contraction ought to be performed indifferently towards the middle of the flesh, the Tendons for the most part are equal; but if the motion inclines more towards one region of the flesh, one Tendon (to wit, which may supply a greater company of Spirits) exceeds the other in magnitude. If the Muscle, whereby it may be the stronger, is big and endued with an ample bulk or substance, it is divided as it were into many Lobes or Bellies, and two Tendons are ordained to each of them; to wit, to the end that the animal Spirits might be carried through short passages from the Tendons into the fleshy fibres, and might leap back again: because the compounded Muscle doth not always contain more series of moving fibres, that it might perform many and divers motions, but that it might make the same motion often with the greater strength. For, as we hinted before, as a simple Muscle was as a single leaver or bar, the compound seems as if it were many leavers or bars serving for the removing the same body conjunctly.

Further, hence we may observe in some Muscles, which are simple and regular, that all the fleshy fibres are equal, and so all the tendinous of one extreme being put together, are equal to all of the other end being put together; yet they single, where they are shorter in one Tendon, are longer in the other, and so disposed, that the tendinous fibres on either part, the top and bottom, have their excesses inverse, and at once equal; to wit, that here a long is laid upon a short, or the longest upon the shortest, and there quite contrary, the shortest upon the longest, to the end, that the motion might be so made every where in this or that side of the Muscle, or at the end more strong, more plentiful Spirits flow together into those parts from the longer tendinous fibres, and on the contrary: wherefore in some Muscles less necessary, where the part of the flesh growing to the bone, either becomes immoveable, or only serves for the filling up of empty spaces, one Tendon is shorter or lesser, and oftentimes degenerates into a bony or cartilaginous hardness. Further it is observed, as to other strong and greatly moving Muscles, that their Tendons are not so disposed, as if they were only stays, props, handles, or hanging crooks of the fleshy fibres; for so they are only constituted in their extreme ends; yet the tendinous fibres, that they may be made more apt promptuaries of the animal Spirits, being stretched out almost into all parts of the Muscle, receive every where both ends of the fleshy; which indeed yet more manifestly appears in the compound Muscles, for that one Tendon being compounded, embraces the extreme flesh, and the other enters into the middle of the flesh, as hath been already shewn.

But truly they animal Spirits, whilst they leap out of the tendinous into the fleshy fibres, are not sufficient of themselves for the wrinkling of them, but require another elastick Copula from the blood; this may be argued from many reasons. First, it seems to appear from this, that the same Spirits being solitary or by themselves, though most thickly planted within the Tendons, stir up no Tumor or Contraction whilst they are moved in them; wherefore being dilated within the fleshy fibres in a lesser quantity, and having got a larger space, they would be stretched out, unless they met or strove with other Particles, much less would they obtain a contractive force. Besides, when any wound or grievous trouble happens to a Tendon, the belly of the Muscle or fleshy part is chiefly troubled with a Tumor or Spasm; for the Spirits being irritated, not so much within themselves, but where they are violently driven among heterogeneous Particles, stir up the greatest tumults and inordinations. But further, when the fleshy fibres are watered with the sanguineous humor beyond other parts, and more than may suffice for their nourishment, for what other use should it be assigned, unless that it may contribute to the motive function? Especially we take notice in lean Bodies, which are more sparingly nourished, that the Muscles being fused or drenched with more plentiful blood, do perform the strongest endeavours of motions: moreover, it doth not appear by what way besides, the expence of the Spirits in a Muscle, consumed with continual hard motions or labours, should be made up or renewed, unless, besides the small supplements by the Nerves, others sufficiently plentiful should be supplied from the bloody mass. Add to these, that members destitute of the wonted afflux of blood, easily fall into weakness or a Palsie; and that from the observation of Doctor Steno, in a live Dog the trunk of the descending Artery being tyed, all the lower or posterior members were suddenly deprived of motion. And though it doth not yet appear plainly to me, whether the exclusion of the blood from the spinal Marrow, or from the Muscles themselves, or from both together, be the cause; yet however it comes almost to the same thing, for as much as the animal Spirits being procreated within the Head, and stretched out by the medullary and nervous Appendices into every member, without the concurrence of the blood, they should not be able to perform the loco-motive power.

Having thus far explained by what means a Muscle being contracted in the fleshy part, as to all the fibres at once, performs the motive function; we shall next inquire, what is the reason of the Instinct whereby every motion, both regular and irregular, is wont to be obeyed or is performed. Concerning this in general, it first appears, that the motions of every regular motion, yea and the impulses of some irregular motions being conceived within the Brain or Cerebel, are transmitted from thence by the Nerves to every Muscle. This (as we have elsewhere shewn) is most evidently declared by the effects and consequences: yet here great difficulties remain, to wit, how by the same passages fresh forces of animal Spirits are conveyed from the Head to every Muscle, and at the same time the old ones exercising the Empire of the Soul; besides, with what difference and divers carriage of the inflowing Spirits, the Nerves perform either of these tasks, or both these offices.

Of these, as I conjecture, it seems that the animal Spirits, which flowing continually from the Head to refresh the forces of the implanted Spirits, are carried to the Muscle by the Nerves, do move to it quietly and easily, and being there presently received by the membranaceous Fibres, they go apart into the Tendons: which kind of relief, although it should be but little in bulk, yet because it is carried night and day by a constant course, it easily arises to a sufficient provision for the continual filling up of the Tendons. But that we suppose, the Spirits so brought perpetually to the Muscle to be transferred by the membranaceous Fibres, and not by the fleshy, to the Tendons, the reason is, because if they should first enter into these, straight running into an elastick Copula, they would stir up the Muscle into continual motions: moreover, for that in the Heart and Muscles of Respiration the fleshy Fibres are exercised with a perpetual motion, they wait not for the passage of fresh Spirits to the Tendons.

But as to what respects the Instincts delivered through the Nerves from the Head for the performing, or staying, or any ways, altering of the muscular motion, of these we ought first to consider, that the moving animal Spirits, whose companies or throngs constitute the Hypostasis of the bodily Soul, have these two properties as it were implanted in their nature; to wit, that whilst they are lively, numerous, and free, they exert or expand themselves, then that force being finished, they being a little diminished, retire themselves and grow quiet; but afterwards being refreshed, they leap out again, and so vicissively. Waking and sleeping, and the alterations of work and idleness or rest, inbred in all living Creatures, sufficiently declare this. Wherefore to the impulse or instincts of some Muscles, (which are wont to be perpetually contracted and released) scarce any thing more is required, but that their Tendons may be supplied by the Nerves with a constant influx of animal Spirits; but the Spirits themselves, because they are numerous and expeditious of their own nature, do willingly leap out into the moving Fibres, then the charge being performed, after a small loss or expence, they immediately withdraw, and being again presently recruited, they are again expanded, and so vicissively. Further, their actions (which chiefly are Pulse and Breathing) are variously changed according to the degrees of heat or of the affections; for as much as the Spirits being brought by the Nerves, are sent from the Cerebel, sometimes more remissly, sometimes more plentifully, or more nimbly.

Further, in some other Muscles subject to the Empire of the Appetite, as the animal Spirits naturally affect turns of expansion and recess, there is only need of a sign to be given, either for the performing or stopping of the commanded motion; either of which, the inflowing Spirits by their various knocking against the Muscle, easily perform, in ordering the implanted Spirits into various aspects or tendencies. When the Muscle is contracted, the implanted Spirits, whilst they are loosened from either end towards the middle, look and tend with a changed front from the middle towards either end. And so, whilst the inflowing Spirits carry the Symbol of performing Contraction, they being incited by heaps within the Nerve, more fully blow up its end, inserted to the Muscle, (where they are more thickly crowded together) and so cause it there to be contracted and abbreviated; whereby it comes to pass, that the same inflowing Spirits, about to enter into Muscle, are at that time stopped by a mere heap, or rather are called back towards the intumefied Nerve; wherefore by and by the whole series of the implanted Spirits (hence their inclination being changed) also looks that way, and so the inhabitants of the Tendons, leaping out from their little Cells into the fleshy Fibres, cause motive contraction: then the motion is broken off or ceases as soon as the Spirits being before called back towards the Nerve, do tend again into the Muscle, and so the front of the Army being again changed, bands of the implanted Spirits are presently compelled into the Tendons. That the thing is in a manner thus, I am perswaded, not out of a mere agreeableness or concinnity of our Hypothesis, but from Anatomical observation, Because once dissecting a Whelp alive, when by chance I beheld some Muscles of the hinder part of the Head and Neck divided and separated at the same instant, wherein the fleshy Fibres, as also the Nerves inserted into them, were seen at once to be contracted, and being intumefied, to be abbreviated.

For the promoting the recess of the Spirits out of the fleshy Fibres into the Tendons, whilst the Muscle is contracted, the membranaceous Fibrils, which every where cut cross wise the fleshy, and thickly stick between, seem to help. The texture of these never to be enough admired, is better perceived in a Muscle endued with large Fibres, viz. an Oxes being boiled to a tenderness. For in such a one, if gently opening the fleshy Fibres, you shall draw them one from another through the whole series, you shall see little Fibrils, like hairs, most thickly extended upon every one of those Tubes, which little Fibrils not only close and knit together the fleshy Fibres, but also lying upon every one of their series, and cutting them in oblique Angles, they also are all carried parallel, from Tendon to Tendon, in an opposite site to the fleshy: therefore whilst the Muscle being contracted, the fleshy Fibres do swell up, the Fibrils embracing them, that they may give place, are somewhat distended; then as soon as the swelling up remits, these returning to their wonted straitness, press together every where the flesh, and the Spirits being expulsed on either side, they reduce them to their pristine length. It makes for this, that whilst the Muscle is contracted, the Spirits inflowing through the Nerves, depart from their membranaceous Fibrils; wherefore these being empty and lax, are able more easily to be distended; but whilst the Muscle is relaxed, the Spirits again entering the Fibrils, fill them, and that they may the better bind the fleshy Fibres, they make them shorter.

The Instincts of Motions, to be obeyed by the Muscles, so delivered by the Nerves, are, being sent either from the Brain, performed at the command, and with the knowledge of the Appetite; or from the Cerebel, according to the Laws of Nature, for the most part unknown to us. But besides, sometimes the Muscles are carried beyond, or contrary to the pleasure of the Appetite or Nature, into irregular motions, *viz.* violent and convulsive, and that happens after various manners and for divers causes. Concerning these, some time since discoursing more largely, we have shewn, that from thence do arise many kinds and differences of convulsive motions; as the Spasmodick matter being somewhere fixed, doth subsist either about the beginnings, middle, or ends of the Nerves; or because the same thing being wandering and loose, runs about here and there through the whole passages of the Nerves, and so variously transfers from place to place convulsive distempers. But besides these divers kinds of Convulsions, which are excited by reason of some evil or vice sticking somewhere to the Nerves themselves, this our Myology or Doctrine of the Muscles, hath discovered some convulsions of another kind arising from the Muscles being chiefly affected.

For indeed we must advertise you, that the animal Spiritis, disposed among the Muscles themselves, by reason of a taint or evil derived from the Brain, or from the Blood, or perhaps oftentimes from both together, are infected with certain heterogeneous Particles, by reason of which they cannot rest or lye quiet in their Cells; but being always unquiet and restless, leap out of their own accord from the tendinous Fibres into the fleshy, and so oftentimes produce frequent and cruel Convulsions. But this we have observed to be done after a twofold manner, *viz.* first, for that the Spirits being burdened with an elastick Copula, remain not long within the Tendons, but leaping out from thence into the fleshy Fibres, induce frequent Convulsions of a Muscle, but short, and as it were by leaps; or secondly, because the animal Spirits, although they sometimes lye quietly within the Tendons, yet being inordinately snatched into the flesh, and there cruelly exploded, they cannot be presently repressed, brought into order, or reduced into the Tendons, but whether we will or not, they persist a long while expanded, and so bring forth a long and very painful contraction of the Muscle, Which kind of Spasm, sufficiently known, we vulgarly term the Cramp.

The former distemper (called the Convulsive Leaping) is familiar both to malignant Fevers, and to the Scurvy. As to those, we have ordinarily known, when either no Crisis, or an evil one is obtained, that heterogeneous Particles from the Blood and nervous juyce very much vitiated, are not only laid up in the Bowels, (whose dispositions and functions they pervert) but almost every where in the Muscles; and there growing to the Spirits, do affect them with a certain madness, so as they cannot continue peaceably together, or rest within the Tendons, but being divided and distracted one from another, leap out from thence by bands into the flesh, and there stir up the lesser and most frequent Spasms or Convulsions. In like manner, by reason of the Spirits inhabiting the Muscles being burdened with an elastick Copula there growing to them, some labouring with an inveterate Scurvy, cannot contain their limbs in the same site or position, but are necessitated sometimes to extend the hands or feet; sometimes to sling them about here and there, to transfer them variously, and sometimes to subdue their madness by running, leaping, or other hard labours.

Treating some time since of Convulsive Motions, we did almost wholly omit the Ætiology of the continuing Spasm or Tetanism, as a thing which depended upon the Doctrine of the Muscles, to be treated of afterwards: Then we only hinted, that the contraction of that kind did arise in one Muscle, because its other Antagonist was resolved or loosened, which indeed oftentimes happens in the face and some members; in which, whilst the parts upon one side are troubled with the Palsie, those opposite on the other, as it were loosened in the Reins, are too much contracted. Notwithstanding, this kind of Spasm for the most part is without pain; besides, this is not easily or presently passed over or cured no more than the Palsie, which is the cause of it.

Therefore as to what belongs to the formal reason of the Spasm, called in our Idiom the Cramp; every one labouring with this distemper, perceives in himself one or more Muscles to be most strongly and involuntarily drawn together, and they being for some time so highly distended, remain as it were stiff; and in the mean time, for that the fleshy Fibres being cruelly contracted, do violently haul or pull either Tendon, to wit, that which is fixed to the immoveable part, perhaps no less than the other part to be moved, they cause a most troublesome pain. But sometimes this Spasm being excited, by reason of the animal Spirits carrying themselves out impetuously into the fleshy Fibres, doth not cease until the same Spirits being returned into the Tendons, suffer the flesh to be relaxed; therefore its nearest causes will be both the greater impetuosity of the animal Spirits among the fleshy Fibres, with which they leap thither unbid; and also their long continuance or stay, for that they return back more slowly and difficultly into the Tendons. For the secondary causes may be reckoned, both the evil disposition of the animal Spirits, and also the evil conformation of the Tendons, *viz.* sometimes this, sometimes that, and not seldom both together.

As to the former; this distemper, as other Convulsions, seems to arise, for as much as the animal Spirits, being burdened with heterogeneous Particles or an elastick Copula, at length being irritated, they are incited to the striking of it off; which notwithstanding, being thick and viscous, and for that cause more tenacious, is not soon nor easily shaken off, but that the Spirits being still provoked by the same, and shut up within the fleshy Fibres, are longer detained in the expansion: which thing perhaps happens not so much unlike, as when water and air being joyned together, make a bubble; which, if it be made of water, wherein a little Sope is put, is more tenacious, much more large, and continues longer than that made

made only of mere water. So we observe, that they who abound in thick and tartareous humors, are most obnoxious to these kind of Cramps, and besides, that they who presently sleep upon drinking or eating gross meats, after full eating, and especially after a large and plentiful supper, do suffer most cruel assaults of this disease; but sometimes the Tendons themselves are found to be in the fault, for that they being too hard bound together or obstructed, they do not easily admit the Spirits returning from the fleshy Fibres. The obstruction of the Tendons is the cause, the Gouty and Scorbutick people, whose Tendons salt and tartareous humors easily run into and obstruct, are wont to be cruelly tormented with these kind of painful Cramps: But that the constriction of the Tendons doth sometimes bring forth this disease, appears by this, for that some Women with Child, (as I have been often told) about the latter end of their Time, by reason of the Muscles of the Abdomen being too much extended, are wont to be troubled with frequent Cramps only in the bottom of their Bellies. For the illustrating of this Pathology we will add this following Case

A Noble Woman, young and fair, some time since obnoxious to Hysterick distempers, and now above two years ago to Convulsive, and in a manner Epileptical; of late, by reason of the frequent and most cruel assaults of the disease, she became also Cachectical and Paralytical, that at length her Abdomen was distempered with an Ascites, and her Legs with a waterish Tumor, and lastly, all her lower parts, below her Hips, were deprived of motion; hence, as often as the Convulsive fits infested her, she was wont, not now to move her body or members here and there, but sometimes these, sometimes those parts being snatched with the Tetanism, were variously bent and twisted about, that in the mean time, she her self sitting in her Bed or Chair, remained stiff and almost immoveable. It is not long since, that seeing the whole manner of one of these Fits, I observed, not without great admiration, divers sorts of turns and changes of alterations of the Spasms. At the first assault, her eyes being turned about swiftly hither and thither, she was presently taken with insensibility, then by and by her head being turned and contracted of one side, presently her arms and legs at once became stiff, and all her Joynts, sometimes of one side, sometimes of both, were bowed or stretched out: perhaps after four or five minutes these Spasms both in her Head and Limbs remitting, of a sudden others, for the most part opposite, followed; which being often finished in the like space, others far different did arise, and so for two or three hours, longer Spasms almost of every kind and fashion, being excited through her whole Body, followed upon one another; so that her head being convulsed or pulled by turns from the right to the left, and contracted before and behind, yea and all her Limbs being bent inwardly here and there, or distended outwardly in the course of one Fit, she exhibited all sorts of Convulsive gestures. When at any time the Spasms of one sort continued longer in the Head or Limbs than usual, it was the custom of the Servants about her to blow up strongly into her Nostrils the Fume of Tobacco; which being done, as the Spirits recovered within, the present Spasms immediately remitted, but upon them others of a new kind succeeded. Of late the Legs of this Lady were so debilitated by being loosened, that she could neither go nor stand, yea her Tendons under either Ham, being made tumid and shorter, were so contracted, that she could not stretch out her Legs straight.

Concerning the case of this sick Noble Lady, it may be demanded, wherefore upon the first coming of the Fit, no throwing about of the Body or Limbs, as is wont in most Convulsive or Epileptical people, but only continued Spasms or Convulsions variously translated from one part to another, and so others, did arise? For the solution of this, we say, that the Spasmodick matter is not only heaped up in the Brain and Nerves, but also in the Muscles themselves, and grows to the Spirits inhabiting the Tendons: And as that matter is tenacious, and the Spirits weak, and unable for the striking off quickly or easily such a Copula; therefore as often as these being irritated, do leap out of the Tendons into the flesh, the Muscles being first possess'd, they cause strong and long Contractions; in the mean time, other Muscles, especially their Antagonists or opposites, being hindered and bound up from motion, until the Convulsions of the former are remitted; hence the Members, however convulsed, are not moved out of their place, because the moving or carrying of the Body, or any Members, is not performed but by the help or duty of many Muscles, whilst some of them either rightly cooperate with others, or at least obey them, to wit, so that some respective Muscles, observing due cooperation, are contracted at once, then those being loosened, the contraction of others immediately succeeds. But if they which are unequal and unlike, are at once, contracted and strongly convulsed, and so continue long, so that other Muscles in the mean time cannot be contracted, there will be a necessity for the members bent or extended here and there, to remain as they are wholly stiff. But that the present Convulsions were always remitted by the blowing the smoke of Tobacco up her Nose, the reason is, because the region or some part of the bodily Soul being vehemently affected, if by chance a new passion equally violent be brought upon another part, the first is presently abolished or ceases: For in truth, it appears by constant observation, where-ever the greater or fiercer trouble is, that thither greater plenty of Spirits presently flock and make a tumult: wherefore any new irritation being excited in the Brain or its Meninges, whatsoever others were begun outwardly among the Muscles, immediately vanish or are obscured; then as soon as this fresh trouble is passed over, Convulsions outwardly arise forthwith again, but in other parts where more heaps of Spasmodick matter lye not yet consumed. But that long continued Spasms do arise, either by reason of the Spirits being burdened with a more tenacious Copula, or by reason of the Tendons being obstructed with a viscous or tartareous matter from either or both, it appears from hence, because this disease increasing (as in the case of this Noble Lady) the Tendons are at length so shortened by the more plentiful heaping up of the morbidick matter, that they be-

come stiff and shorter, and for that reason they hardly or not at all grant any place to the Spirits for the constant performing of the motive function.

Thus much for the Muscular Motion, both natural and convulsive, and the reasons of both, which we have proved with what diligence we are able, and by Anatomical Experiments: But if any one shall object, that they are not very firm, because we have noted in the cutting up of live Creatures, that the Heart and Muscles of Respiration and the fleshy Pannicle, after that the Nerves and Arteries are cut away, do continue for some time their turns of Contraction and Relaxation, whence it is argued, against our Hypothesis, that their motions do not depend upon the constant influx of the blood and animal Spirits; it will be plain to return this Answer, That in those about to dye, it sometimes happens so, because the Soul being then distracted and drawing near to dissolution, all the implanted Spirits at once being cut off from the commerce of those influencing or flowing in, do of their own accord exert themselves, and perform (as long as they are able) their wonted motions; which being continued for a little space only, need not the subsidy or assistance of fresh forces, because the veterane, till they are quite worn out, perform their wonted tasks; yea also the old sanguineous Copula, till it be wholly consumed, receives and lets go their embraces with a constant change; But this more rarely succeeds in other Muscles subject to the Empire of the Appetite, and wont only to be exercised as occasion served.

Moreover, as we have affirmed, that the Instinct for the performing of Motions is brought altogether through the Nerves from the Head to the Muscle, and as every Trunk of the same Nerve, being oftentimes broken into many shoots, variously distributing them, sends it to many destinated Muscles, it may very well be doubted, how the animal Spirits, conveying the Symbol of the motion to be performed with a certain choice, do actuate only these or those branches apart from other branches of the same, and do not indifferently enter all the branches or shoots of the same; to wit, as the blood passes through the Trunk of the Artery, and all its ramifications equally. The most Learned *Regius*, that he might solve this knot, supposes in the Nerves some little doors, like to those which are found in musical Organs, the apertures whereof admit the Spirits to these or those parts especially, the rest being shut up. But he ought to have shewn, if not the little doors themselves, yet at least by what instinct and by whose direction sometimes these, sometimes those are locked up, and others opened. But in truth, this may rather be said; that all the shoots of the Nerves and lesser branches remain distinct and singular among themselves from the parts to which they are inserted, even to their beginnings; so that a peculiar tract of the Spirits or way of passage lyes open from the Brain and its medullary Appendix, to every Muscle and nervous part; for in truth, although the Nerves, according to their beginnings, may seem to arise from the greater Trunks; yet it will easily appear, if you shall open the trunk and those branches, that in them many little Nerves, only like hairs, for the sake of a better conduct, are collected together in the same bundle; yea, the coverings being separated, you may follow oftentimes the little Nervulets, and those single to the respective parts and members, to which they are destinated.

But in the mean time, although there be singular passages or chanelles of the animal Spirits of most Nerves, distinct among themselves; yet some do variously communicate with others through the branches and shoots sent on either side; which indeed ought to be so made, that when many Nerves together, are required to some motion of a Muscle equally, all these, by reason of the commerce mutually had between themselves, might conspire in the same action, hence, in some motions of the members, as in the striking of a Harp or Lute and other complicated actions, many Muscles cooperate with admirable celerity; so that, although many be employed at once, they perform their task severally without any confusion. Besides, there is need for the Nerves to communicate mutually among themselves, because of the Sympathetical motions of the members and of some of the parts, for neither for any other cause is the Nerve of the Diaphragma inserted into the brachial branches, or those belonging to the Arms, than that the exercise of living Creatures, especially in running or flying, might be proportionate to the tenour of Respiration. Hence it also proceeds, that in any passion, the Præcordia being bound up or dilated, the countenance and aspect of the face, yea and the gestures of the hands and members are pathetically figured. We have proposed sufficient Instances of this sort in our particular History of the Nerves, so that we need not here add any thing more.

What remains for the illustrating our Myology or Tract of the Muscles, we have taken care to have added, viz. four Figures, which may represent to the life both the exterior and interior true and natural faces or appearances both of a simple and compounded Muscle.

The Explication of the Figures.

The First Figure

Shews a simple regular Muscle, described according to its natural appearance, in the Belly of which the fleshy Fibres being opened, are diduced one from another, that the membranaceous Fibrils may be the better beheld.

- A. The right Tendon.
- B. The left opposite Tendon.
- C. The fleshy Belly; all the fleshy Fibres of which lye one by another equal and parallel, but in even and oblique Angles between either Tendon.
- D. The aperture of the fleshy Fibres, which being drawn aside, the membranaceous Fibrils, thickly crossing them, appear.

The Secod Figure

Shews a simple Muscle cleft in the middle, after the Tendon being cut off, and portions of it pulled away, that the interior series of the fleshy Fibres, or their commixtures or mingling with the Tendons, may appear.

- AA. The right Tendon being placed above, both portions of which divided, do in some measure appear.
- BB. The left opposite Tendon placed below, either portions of which divided, lye hid for the most part under the Flesh, those towards the edges being only conspicuous.
- CD. Portions of the fleshy Belly divided and separated, which before (this being laid upon that) did cohere, in either of which all the fleshy Fibres proceed equally, and in like manner obliquely from one Tendon to another.
- E. Some membranaceous Fibrils represented, thickly crossing the fleshy Fibres.

The Third Figure.

Exhibits a certain Muscle less compounded, to whose two fleshy Bellies two compounded Tendons also (equal to four simple ones) are destinated.

- A. The exterior compounded Tendon, embracing either side of the fleshy Fibres, which being almost only conspicuous on the edges, lies hid for the most part under the Flesh.
- B. The interior compounded Tendon, entring into the middle of the Flesh, which receives on both sides the fleshy Fibres, sent from either side of the exterior Tendon.
- C. The first Belly of the fleshy Fibres, all whose equal and parallel Fibres lye between the opposite sides of the Tendons in oblique Angles and equal.
- D. The second Belly of the fleshy Fibres, all whose Fibres being in like manner formed, are beheld in the same as in the other Belly.
- EE. Both extremities of the exterior compounded Tendon.
- F. The extremity or end of the interior compounded Tendon, the like to the other being opposite, at an equal distance from the end of the Muscle.

The Fourth Figure.

Shews a regular compounded Muscle, divided and opened in the middle, so that the interior face of either Belly may appear.

- A. The exterior compounded Tendon cleft into four parts.
- BB. Portions of one side of the divided Tendon separated from the other.
- C. Portions near sited, of the other side of the divided Tendon, which for the greatest part lye hid under the flesh.
- DD. The flesh of one Belly also divided, and separated one far from another.
- EE. The flesh of the other Belly also divided, and placed near one another.
- F. The interior compounded Tendon entring the middle of the Flesh.
- GG. Portions of the same Tendon divided, and with portions of the Bellies, which they receive, separated apart.

THE ANATOMY OF THE BRAIN.

The Authors Epistle Dedicatory to his Grace Gilbert Archbishop of Canterbury, &c.

Most honourable Prelate,

ONCE more your *Sidley* Professor and your Servant (the more happy Title) flings himself at Your feet, with this only Ambition, that he might render something of Thanks for Your Kindness and benefits, and that our Labours might chuse such a Patron, that might give Credit to the Author. But I fear, lest by my repeated Duty I may seem troublesome, and no less in acknowledging Your Benefits, than others in suing for them: But so great is my Gratitude, and so exceeding is your good Nature, that they cannot be crowded into a little compass, much less wearied out or drawn dry.

But there is another reason, which if it doth not command what I do, may at least excuse and defend it. For when I had resolved to unlock the secret places of Mans Mind, and to look into the living and breathing Chapel of the Deity (as far as our weakness was able) I thought it not lawful to make use of the Favours and Patronage of a less Person, neither perhaps would it have become me. For You indeed are He, who most happily presides (both by Merit and Authority) over all our Temples and Sacred Things. Therefore after I had slain so many Victims, whole Hecatombs almost of all Animals, in the Anatomical Court, I could not have thought them rightly offered, unless they had been brought to the most holy Altar of Your Grace.

I am not ignorant, how great the labour is that I undertake: For it hath been a long while accounted as a certain Mystery and School-house of Atheism to search into Nature, as if whatever Reasons we grant to Philosophy, should derogate from Religion, and all that should be attributed to second causes, did take away from the first.

The Epistle Dedicatory.

But truly, he doth too much abuse the Name of Philosophy, who considers the wheels, curious frame, setting together, small pins, and all the make and provision of a Clock, by which invented Machine the course of the Time, the orders of the Months, the changes of the Planets, the flowing and ebbing of the Sea, and other things of that kind, may be exactly known and measured, if that at length, when by this his search and consideration, he hath profited himself so much, he should not acknowledge the Artist, to whose Labour and Wit he owes all those things.

I am sure I am of another mind and opinion, who look into the Pandects of Nature, as into another Table of the Divine Word, and the greater Bible: For indeed, in either Volume there is no high point, which requires not the care, or refuses the industry of an Interpreter; there is no Page certainly which shews not the Author, and his Power, Goodness, Trust, and Wisdom.

In the mean time, there is no right Weigher of things that can lay to our charge as a fault, that we have studied these Rolls of Nature, because some Atheists may be made thereby; which may be objected to the studies of Divines in Sacred Letters, that from their provision Hereticks have taken their Arguments and Opinions, and turned them against them and Godliness.

That I may deal freely, whoever professes Philosophy, and doth not think rightly of God, I do judge him not only to have shaken hands with Religion, but also with Reason, and that he hath at once put off Philosophy as well as Christianity. Therefore I desire, that all mine may be tryed and approved, no less by the demonstration of Piety and Canons of the Church, than by the Rule of Experience and Knowledge, to which I keep: Neither do I intreat and respect only the *Mecenas* of humane Arts, but also the Primate and chief of Divine, whilst I openly profess my self, with all due observance,

YOUR GRACES

Most humble and obliged Servant,

THO. WALLIS.

THE

THE PREFACE TO THE READER.

THE Romans sometimes promised to themselves an Empire, an Eternity by the happy Augury of an humane Head being turned out of the Glebe; neither could they persuade themselves, that the Capitol should be the Head of the World, unless it had been built upon the Skull of a Man. I do not think of Empires in Arts, nor do I promise to my self Triumphs by overcoming the World of Letters: But in the mean time, I had wholly frustrated those Illustrious Documents I had long since learned, unless with those Auspices I had laboured in Philosophy, especially the Natural.

For the Province, which I hold in this Academy, requiring that I should Comment on the Offices of the Senses, both external and also internal, and of the Faculties and Affections of the Soul, as also of the Organs and various provisions of all these; I had thought of some rational Arguments for that purpose, and from the appearances raised some not unlikely Hypotheses, which (as uses to be in these kind of businesses) at length accrued into a certain System of Art and frame of Doctrine. But when at last the force of Invention being spent, I had handled each again, and brought them to a severer test, I seemed to my self, like a Painter, that had delineated the Head of a Man, not after the form a Master, but at the will of a bold Fancy and Pencil, and had followed not that which was most true, but what was most convenient, and what was rather desired than what was known. Thinking on these things seriously with my self, I awaked at length sad, as one out of a pleasant dream; to wit, I was ashamed that I had been so easie hitherto, and that I had drawn out for my self and Auditors a certain Poetical Philosophy and Physick neatly wrought with Novity and Conjectures and had made a Fucus as it were with deceits and incantations for either of us.

Wherefore all delay being laid aside, I determined with my self seriously to enter presently upon a new course, and to rely on this one thing, not to pin my faith on the received Opinions of others, nor on the suspicions and guesses of my own mind, but for the future to believe Nature and ocular demonstrations: Therefore thenceforward I betook my self wholly to the study of Anatomy; and as I did chiefly inquire into the offices and uses of the Brain and its nervous Appendix, I addicted my self to the opening of Heads especially, and of every kind, and to inspect as much as I was able frequently and seriously the Contents; that after the figures, sites, processes of the whole and singular parts should be considered with their other bodies, respects, and habits, some truth might at length be drawn forth concerning the exercise, defects, and irregularities of the Animal Government; and so a firm and stable Basis might be laid, on which not only a more certain Physiologie than I had gained in the Schools, but what I had long thought upon, the Pathologie of the Brain and nervous stack, might be built.

But for the more accurate performing this work, as I had not leisure, and perhaps not wit enough of my self, I was not ashamed to require the help of others. And here I made use of the Labours of the most Learned Physician and highly skilful Anatomist, Doctor Richard Lower, for my help and Companion; the edge of whose Knife and Wit I willingly acknowledge to have been an help to me for the better searching out both the frame and Offices of before hidden Bodies. Wherefore having got this help and Companion, no day almost past over without some Anatomical administration; so that in a short space there was nothing of the Brain, and its Appendix within the Skull, that seemed not plainly detected, and intimately beheld by us. After this, when we entred upon a far more difficult task, viz. the

Anatomy

THE PREFACE.

Anatomy of the Nerves, then very much appeared the plainly to be admired skill of this Man, as also his indefatigable Industry, and unwearied Labour: For having prosecuted, with a most exact search, all the divarications, wandring on every side of the Nerve, how minute or small soever, and immersed, and variously infolded within other Bodies, and so turning over the Labyrinths of the Branches, and shoots of every pair, far and near diffused, he drew out with his own hand the Schemes, Images, or Draughts of them, and also of many passages of the Blood, as they appear in this Tract; which indeed, that they might be faithfully and most exactly shewn, without any falsity or error, he caused, that no Table might contain scarce any line or the most light passage, whose conformation and exact habitude he had not found proved by the marks or inspection of many Animals for that purpose killed.

Besides the help brought me by his most skilful dissecting hand, it becomes me not to hide, how much besides I did receive from these most famous Men, Dr. Thomas Millington Doctor in Physick, and Dr. Ch. Wren Doctor of Laws, and Savill Professor of Astronomy; both which were wont frequently to be present at our Dissections, and to confer and reason about the uses of the Parts. Besides, the former most Learned Man, to whom I from day to day proposed privately my Conjectures and Observations, often confirmed me by his Suffrage, being uncertain in my mind, and not trusting to my own opinion. But the other most renowned Man, Dr. Wren, was pleased out of his singular humanity, wherewith he abounds, to delineate with his own most skilful hands many Figures of the Brain and Skull, whereby the work might be more exact.

But although instructed by these helps, and as it were hem'd in by the plentiful assistances of these Illustrious Men, I come forth on the Stage, I presume I shall not be however safe from calumny, and free from blame and most just reprehension: because here is inquired into the recesses and most inward dens of the Brain, and its depending parts as it were shut and sealed up; concerning the certain uses of which, scarce any thing may be brought forth, but that, as it may be published and shewn, for the Judgments of the more Learned, so it may be carpt at and torn by the opprobries of detractors. In other parts, where matters appear to the Senses, we do not so easily run upon errors. For in most of the Viscera and Vessels, the Contents and contained humors, as also their passages within the larger Cavities of the containing parts, are discerned by the sight: But in the Brain and Nerves, neither the rushings on or impressions, viz. the Animal Spirits themselves, nor their tracts or footsteps, can any ways be seen. Wherefore to explicate the uses of the Brain, seems as difficult a task as to paint the Soul, of which it is commonly said, That it understands all things but it self: for in truth, the unwearied labour of the Brain beholds or searches the hidden places of other Bodies, in the mean time the economy or regiment of its own Family and Kingdom being wholly hid and unknown.

But what we profess to be performed by us in the following Tract, and hope for the future from the help or labour of others, is chiefly this; to wit, that we have not rashly described the parts themselves, of which the Anatomy is instituted, but that we have with diligent care and great trust collected the various appearances and Arguments of Observations by a manifold Dissection. Which things, if you shall delineate out of those Sentences and granted Decrees, as it were to a Mathematical Rule, and from thence would collect a Theory as yet lame, and that may not appear absolute in all its numbers, no doubt but that a longer time, and the getting of more Observations may give it a more perfect form, that Antiquity may not have said altogether in vain, That Minerva was born from the Brain, Vulcan with his Instruments playing the Midwife: For either by this way, viz. by Wounds and Death, by Anatomy, and a Casarean Birth, Truth will be brought to Light, or for ever lye hid.

THE ANATOMY OF THE BRAIN.

CHAP. I.

The Method or Anatomical Administration of Dissecting the Brain is proposed.

AMong the various parts of an animated Body, which are subject to Anatomical disquisition, none is presumed to be easier or better known than the Brain : yet in the mean time, there is none less or more imperfectly understood. All of it that appears, and is commonly described in the forepart or forehead, is beheld almost at a sight or two after some rude cutting up ; but if you seek what lyes hid in the recesses for that end, new bosoms and productions of Bodies, before hid, are every where laid open : yea the parts of the Brain it self are so complicated and involved, and their respects and habitudes to one another so hard to be extricated, that it may seem a more hard task to institute its perfect Anatomy, than to delineate on a plain, the flexions and Meanders of some Labyrinth : Because, as we are not able to estimate the measure or to paint forth the pattern or draught of the frame of this, so neither of that, unless the bulk or substance of the subject be first searched to the bottom, and its frame broken into pieces. Hence it came to pass, that the old Anatomists in dissecting the Brain, not sufficiently attending what was placed first, what second, and what after that in the order of Nature, cut its Globe as it were into slices or parts, and the Phenomena arising by chance from such a dissection, they easily esteemed for true parts of the Brain ; when yet in the mean-time, by others from a dissection otherwise made, the parts and processes of it appear far different from the former. The reason of which is, because the substance or frame of the Brain and its Appendix lyes so within the Skull, that there are many swellings or tuberos risings, with several tails or little feet compacted together : all which, although distinct one from another, and are endued with figures diversly expanded ; yet they, that they may be contained in a lesser room, are thrust as it were into the same Globe, and so complicated among themselves, that it is a hard thing to find out where the beginning and end of the Brain, as also where the limits and partitions of the near adjoining parts do remain ; further, that the several parts of the Encephalon so complicated, may retain their site, nor presently being loosned one from another, may spring forth, they are knit together into due foldings, with Fibres and Membranes stretched out from part to part. And as often as the substance or bulk of the Brain so conglobated or rolled together is cut, there is as often a necessity that the slips being cut, the portions of divers parts cleaving together, are carried away with them. Wherefore that a true and genuine description of the Brain might be shewed before its substance and continuity is dissolved, before all things its whole frame or substance ought to be explicated, and the knitting of the Membranes being wholly loosned, the several parts ought to be turned over and stretched forth into their proper dimensions. By what means these things may be done, and by what Method the dissection or Anatomical administration of the Brain may be best performed, ought here in the first place to be shewn ; then these things being first done, we will more largely deliver the Description of the Brain, together with the use and action of its several parts.

That the perfect knowledge of the Brain and its parts may be gained, it is necessary not only to dissect and look into mens Heads, but all other kind of living Creatures heads; for besides, that the humane Heads or Bodies are not so readily to be had, that one may from day to day behold the Brain and its frame, and carefully consider the situation of the parts, and search one after another their respects, habitudes, and dependencies; besides also the immense bulk of an humane Head is in it self an hinderance, whereby its most intricate frame and various recesses and Appendices are the less accurately discerned and investigated: all which being reduced into an Epitomy, are plainly represented more commodiously in the dissection of Beasts. Wherefore when the form and composition of the Brain in a Dog, Calf, Sheep, Hog, and many other four-footed beasts, were little different (the magnitude only excepted) from the figure of the same, and the disposition of the parts, in a man, I was the more satisfied to compose a certain Anatomy of the Brain by the frequent dissection of all sorts of living Creatures. And in this imployment, for that I shall shew the communities and differences which the subjected parts obtain in various Animals, compared among themselves, and with man; certainly from such a compared Anatomy, not only the faculties and uses of every Organ, but the impressions, influences, and secret ways of working of the sensitive Soul it self will be discovered. Concerning the Heads of living Creatures, in the dissection of which it happened for us chiefly to be exercised, it was observed, as to the chief parts of the Head, that there was a notable Analogy between Man and four-footed Beasts, also between Birds and Fishes: For when the first Inhabitants of the new-made World were produced, as one day brought forth Fowl and Fishes at once, another in like manner Man and four-footed Beasts, so there is in either twin species a like form of the Brain; but between that Child of the former, and this of the following day, there is found a great difference as to those parts. For as much therefore as Men and four-footed Beasts have got more perfect Brains, and more alike among themselves, we have ordered our Observations from their Inspection: Then afterwards we shall deliver the Anatomy of the Brain in Fowl and Fishes. And here first concerning the Heads of Men and four-footed Beasts, (as we hinted but now) we will propose a Method of Dissection it self, or of Anatomical Administration, and will at once recite all the parts one after another, and as it were in a compendious Catalogue; then we will by and by more largely draw out the Particles of the Brain and of its Appendix, so shadowed, in a short Table, and will design their uses and actions for the exercise of every faculty.

When therefore we had in our hands the Head of a Man, or Dog, Calf, or Sheep, its more outward coverings were taken off; concerning which, as they are well enough known, we are not at all solicitous: then the covering of the Skull being divided by a Saw or Instrument, and taken away, on every side the bones are broken off with a pair of Scissers or a Penknife to the Basis of the Skull, that so the Contents might, as much as may be, be all made plain or open to the Spectators. What therefore comes first in view is the hard Meninx including all the rest with a common covering. This Membrane outwardly and above is knit to the Skull in divers places, especially about the Sutures; but indeed about the foot or Basis it most strictly cleaves to the bones, so that it cannot easily be pulled away. Inwardly (or in its hollow superficies) it is lax and loose enough, unless that nigh all its bosoms by the insertions of the Veins, and in the Basis of the Skull by the Arteries and the Nerves it is tyed to the *Pia Mater*.

This same Membrane between the *Interstitia* or division of the Brain, and besides of the Cerebel it self insinuating it self deeply on one side, and rising up again on the other, leaves some duplicatures or infoldings, in which, being shut up above by the increase of the same Membrane, Cavities, which they commonly call Bosoms, are formed: to wit, by this means, almost the three first bosoms are constituted; but the fourth is a smooth and longish, and also hollow process of the same Membrane, which is sent through the *Interstitia* of the Brain, nigh the end of the callous body, even to the pineal Glandula. The Cavities of the greater Bosoms are severed in many places, as it were into little Cells; as it seems for that end, that the blood passing so through the various turnings in those ends, may be hindered from a more rapid motion.

Besides, this Meninx or Film of the Brain admits two Arteries from either side, one conjugation of which arises not far from the Carotick Arteries through the holes of the Cuneiform bone, but the other from the bone of the Forehead: all which indeed being diffused through the exterior superficies of the Membrane, water it; but are terminated, partly in the Skull, especially nigh the Sutures, whither they convey the blood, and partly in the bosoms, where, what is superfluous is laid up. Moreover, these Arteries perforate the hard Meninx in several places on the top of the Brain (as *Webster* observes) and impart some shoots to the *Pia Mater*. Lastly, the exterior superficies of this Meninx is no where planted with so many shoots of Veins as Arteries; but from its four Bosoms (which are the veinous Receptacles of the blood) many Veins go out through the interior superficies of this Membrane, which being inserted in the *Pia Mater*, are presently dispersed through its whole compass, and the same sliding down on every side from the bosoms, meet every where the Arteries ascending from the Basis of the Head, and being intermingled with them, constitute the manifold infoldings of the Vessels.

That these may be the better beheld, after the Arteries are sufficiently noted, let the hard Meninx be cut round near the border of the broken Skull; then let whatever of it serves for a covering and partition to the Brain and Cerebel, be lifted up, that the goings out of the Vessels, viz. the Veins and their distributions into the *Pia Mater* may be considered: which being afterwards broken asunder, let the Membrane with its bosoms be wholly taken away; but the reliques of this Membrane, which

which stick to the bones at the bottom of the Skull, should be separated, so that the whole frame or substance of the Brain and its Appendix may be somewhat elevated, and moved here and there, be every where conspicuous, and at length taken from the Skull. But that these things may be performed, you must begin from the anterior or fore part, where the bone of the Forehead separates it.

Therefore if the prow of the Brain, hid under this bone, be a little lifted up, the mammillary processes come presently in sight, together with the smelling Nerves hanging to them: which being dissected near the Insertion, there will appear an hollowness in either process. These are large and round, also full of clear water in Calves: but in either smelling Nerve a manifest Cavity is found continued on either side to the anterior Ventricles of the Brain, to which if a Pipe be put and blown into, presently the whole substance of the Brain will swell.

Next the smelling Nerves about the Cocks comb, two small Arteries are seen to arise from the Skull, and to be carried towards the *Interstitium* of the Brain, which in truth are branches of the Carotides, which are knit to the dilated Comb before, and from thence are seen to be reflected to the anterior Brain.

These Vessels being there dissected, the coming together and going out of the Optick Nerves follow; the trunk of which being cut off a little lower, the Tunnel, and out of both its sides the Arteries called Carotides, arising out of the Guniform-bone, do appear; which are more clearly beheld, if the Brain be lifted up. These also being cut off, and the Brain farther bent back, the moving Nerves of the Eyes presently shew themselves; and so from thence the other pairs of Nerves follow in order, that one pair of them being cut off, and the Brain with its Appendix more lifted up, the next is still obvious to those beholding it, till all the Nerves arising within the Skull, and also the Arteries, both the Carotides, and the Vertebral being at length cut off, the whole frame of the Head may be taken out of the Skull.

But (that these Vessels may be described in the same order as they are met with in the cutting them up) two small Nerves follow after those moving Nerves of the Eyes, which, for a reason hereafter rendered, we call Pathetick. These Nerves higher than the rest, arising behind two round Prominences called Nates and Testes, (the Buttocks and Stones of the Brain) and bending down forward, and entering for a little space under the *dura Mater*, then coming out through the same hole, together with the former, from the Skull, are propagated into the sight of the Eye. This pair is called by *Fallopini* the eighth, by us the fourth.

Beneath these little Nerves, from both sides of the annular protuberance, (which being sent from the Cerebel compasses the oblong Marrow) two Nerves of noted magnitude arise, which, after they have passed through the *dura Mater*, send forth another notable branch on either side straight down without the Skull, the other branch, by a longer tract, passing through both sides the Skull near the Turkey Chair. These Nerves (as is shewn afterwards) having gotten a larger Province, are enlarged in the Palate, the parts of the Mouth and Face, and also their branches in the Nose and Eyes, yea they impart roots to the intercostal Nerve. We call this pair the fifth, commonly esteemed the third.

Nigh to the beginning of these, out of the lowest foot of the oblong Marrow or Pith, two lesser Nerves, endued with a single trunk, arise, which being dilated forward, and presently entering under the *dura Mater*, come out of the same hole with the moving Nerves of the Eyes, and are all carried into the balls of the Eyes. This pair is called by us the sixth.

Next to these Nerves follow the auditory or hearing pair, which indeed arises higher from the sides of the oblong Marrow, in what part the Cerebel is hanged to it; viz. nigh the lesser annular process; from whence it is immediately carried with a double process into the hole of the stony Bone: one of its branches is harder, serving chiefly for motion; the other altogether medullary and softer, as it were only destinated to sense.

A little lower arises the wandering pair, which is commonly called the sixth. This seems to be made of many Nerves, many of which arise together; and to them comes another, endued with a greater trunk, which being brought from the end of the oblong Marrow, yea beyond this, out of the spinal Marrow, is united with the former. And so all being made like a bundle of Nerves, go out through the hole of the hinder part of the Head; through which also goes out the greater branch of the internal jugular Vein. This is by us called the eighth pair.

Under the wandering pair, almost out of the Basis of the oblong Marrow, another pair arises, consisting also of many Fibres, which going straight down, and being presently immersed in the *dura Mater*, comes forth again through a peculiar hole out of the Skull; then either Nerve being inoculated into the trunk of the wandering pair, is presently bended back towards the Tongue. In a man a peculiar protuberance grows above the oblong Marrow, out of which the beginning of this Nerve proceeds. This we call the ninth pair.

Below this, in the lowest part of the hinder part of the Head, out of the sides of the oblong Marrow, where it is about to go into the spinal, another pair, consisting also of many Fibres, arises; which tending towards the spinal Marrow, enters the *dura Mater* at the same place where the Vertebral Artery ascends into the Brain; yet it arises out of the bosoms of the bones, but below the first Vertebra or Joyn, from whence it is carried into the Muscles of the hinder part of the Neck, so that it is doubtful, whether this pair ought to be called the last of the Skull, or the first of the *Vertebrae*.

When these parts, viz. the aforesaid Nerves and Arteries, both the *Carotides* and the *Vertebals*, with the jugular Veins (by which the *Encephalon* is fastned to the foot or basis of the Skull) are cut off, and their ends stretched out as much as may be; either let them remain in the taken out substance or frame, whereby the beginnings of all the Nerves may be plainly noted; or the trunks of them being cut off near the roots, may be left in the holes of the Skull, whereby their goings out and distributions may be observed. The images of either Example are delineated in the first and second Table.

The business of Dissection being thus far brought, the residue of the Skull shews many things worthy consideration, of which we shall speak particularly afterwards; But first we ought to view thoroughly the taken out frame or substance of the Brain, together with its Appendix, and to examine all its appearances as they follow in the order of Dissection.

The substance or Bulk being taken out, which is of a somewhat round figure, or spherical, it exhibits to the sight in its superiour and convex part the Brain and Cerebel; but the oblong Marrow, with the utmost borders or edges of the superiour bodies, possesses almost all the basis or its lowest part. The thinner *Meninx* covers these three placed near, and the outward superficies of them all: nor doth it clothe the same loosely, but deeply insinuating it self into all their cavities, and recesses, covers and binds them strictly. And as this Membrane is every where interwoven, with the folds of the Vessels, by its stretching out, it reaches the same to every part and portion, and so waters the whole with a sufficient afflux of blood. Here we must consider the Vessels of this Membrane and its protension.

As to the former, the whole superficies of the frame of the subject may be seen, covered with the infoldings of Vessels, as it were with a net admirably variegated or flourished, and its sight or aspect shews like the picture of a fruit-bearing wood, the Idea of which, the Vessels of the Brain more aptly represent, and are themselves seen better and more distinctly, if you first squirt into the Carotidick Artery some black liquor. The Vessels interwoven within the thin *Meninx* or *Pia Mater* are Arteries and Veins. The Arteries are four, viz. two *Carotides* and two *Vertebals*. Out of either side of the Tunnel the ends of the cut off *Carotidick Arteries* shew themselves, the trunks of which ascending upwards, are presently diffused from either side into the anterior and posterior, or fore and hinder branch. Either pair of these inclining one towards the other, are mutually conjoynd: moreover, the posterior branches so joyned, are united with the Vertebral branches (growing together first into one trunk,) For the Vertebral Arteries, arising from the last hole but one of the Skull, fall at first divided through the sides of the oblong Marrow; then united in its basis, they go into a single channel, which meeting with the hinder branches of the *Carotides* (as it is said) it is joyned with them; and from that place of the joyning of them together, a noted branch ascends on either side under the edge or rim of the Brain, which being dilated upon the shanks or stocks of the oblong Marrow, is cleft or divided into very many small shoots like hairs, some of which ascend to the Glandula's placed behind the Cerebel, but the rest make the arterious part of the *Chorooides* infoldings. The anterior branches of the *Carotides*, before they are united, send from themselves on either side a noted branch, which creeping upwards like a bounding River, distinguishes either Hemisphere of the Brain as it were into two Provinces; but after the aforesaid branches are united, presently departing again from one another, they are carried to the Prow of the Brain, and from thence bending back between its Hemispheres, they fall upon the callous body. All these Arteries, before and after their mutual joyning together, send forth shoots and little branches on every side, which do not only creep through and intimately bind about the utmost compass of its Sphere, but its *Pentralia*, and more inward recesses, like the young branches of Vines. The ramifications or these sorts of branchings, both of the *Carotides* and of the *Vertebals*, are shewn in the first Table, as they are found in a Man, and as a Sheep in the second Table.

Moreover, this thinner *Meninx* or *Pia Mater*, cloathing the whole Brain, and its parts, as it receives the Arteries ascending (as hath been said) from a four-fold Fountain, so it is stuffed throughout with Veins, sent from four bosoms. These Vessels mutually meeting, are complicated together, and almost every where constitute by their branches derived from both, and meeting one the other, and variously contorted among themselves, the net-like or retiform infoldings; which indeed are not only outwardly in the superficies, but in the dissection, where-ever you may separate one part from another, without breaking it, these kind of infoldings of the Vessels are to be found. Because, if you behold this frame, taken out of the Skull, collecting together the tops of all the turnings and the *Interstitia* in this Membrane, and covering them with the joynings of the Vessels, it will make the whole compass or frame of the *Encephalon* appear like a curious quilted ball. But if you go on to cast abroad this Sphere, and to separate the cleaving parts, knit together, of this Membrane, one from another, you will soon find, that this *Meninx* covers the gapings of the crevices or turning chaps of the Brain, binds the *Interstitia* of either moiety or Hemisphere, draws together the hinder part of the Brain, otherwise being lax and hanging loose, and compassing about every border of it, as it were with a Welt, knits it to the oblong Marrow: and what is the chief of all, the universal Cortical or shelly substance of the Brain (so wit, in which the animal Spirits are procreated) is covered over with this Membrane planted with most frequent infoldings of the Vessels; notwithstanding the interior superficies of the Brain being stretched out, (which being called the Callous body, is altogether medullary and white) is not cloathed with this Membrane: but instead of it many foldings of vessels, commonly called *Chorooides*, are hung and as it were freely flow within its complicature. The reason of which is, because as this part, to wit, the callous body, is rather designed for the Circulation than for the generation of Spirits, therefore it admits not a more plentiful influx of blood: nevertheless, for as much as there is

is need of heat, whereby the Spirits may be there more easily circulated, the blood being moved, within the Vessels hanging there through the empty space, might afford heat as it were from a fire kindled within a Stove. But within all the other recesses of the Brain, and besides, within the folds or lappets of the Cerebel, yea, and the *Interstitia* or gaps of both these, and of the oblong Marrow, this *Meninx* inlinuates it self, and inserts the distributions of the Vessels. In truth, the protension or out-stretching of this Membrane seems therefore the more admirable, because having no where a peculiar place of its origine, it not only binds about the Head or *Encephalon* with a common covering, but also cloaths all its parts with proper coverings, and knits together their tops and processes. Yea, this *Meninx* seems to enjoy a manifold and divers original: for where-ever the gapings or *Interstitia* of any parts or processes happen, portions of this Membrane there springing forth, cover them all, and gather them together, and reach to them the ramifications or branchings of the Vessels. In a moister Brain this *Meninx* may be easily separated, and ample and large portions of it pulled away with the fingers; which being drawn away, the insertions of the Vessels, into the substance of the Brain and its Appendix, every where clearly appear. Lastly, by this means the brain being thus left naked, unclothed of its Membranes and Coverings; its make or fabrick, and the disposition or order of all its parts are next subjected to Anatomical Inspection.

That the Anatomy of the Brain, properly so called, might be rightly celebrated, I judge we ought not to proceed after the common way of Dissection. But when as the substance of the whole Head, taken out of the Skull, stands in view, first let the hinder partition of the Brain, where it is knit to the Cerebel and oblong Marrow or Pith, the Membranes being every where cut or pulled off, be freed (as much as it may be) from its cleaving to the subjected parts; then it will easily appear, that the substance of the Brain is not united to those bodies, but of it self is altogether free and independent of them, unless where it is joyned towards the superficies by the knitting of the Membranes. Also this keel or hinder part of the Brain being divided by this means from the neighbouring parts, if the fore-part be bent back, the shanks of the oblong Marrow will appear wholly naked, and distinct from the Brain and Cerebel (unless where they are in some places hung to it.) Moreover, when the partition of the Brain, being loosed from its cohesion, is lifted up, the three Ventricles, commonly so called, go into one empty space or mere vacuity, resulting from the complication of the Brain. Besides, it may be observed, how the Brain before is only united to the oblong Marrow; and that in two places of its shanks, as it were the tops, it is fixed; which *Fornix* so called, or arched Vault, is as it were a string or ligament, which arising before, where the Brain is hanging to it, is carried to its hinder border, to which it is united as it were with two stretched out arms, and so it holds together the whole frame of the brain, lest it be rolled out into a plain, still in a spherical figure, and firmly binds the same to the shanks of the oblong Marrow. From the knitting of the other parts of the humane brain divided and lifted upwards, whereby the vacuity resulting from its infolding, and esteemed for Ventricles, also whereby the *Fornix* or arched Vault and Shanks of the oblong Marrow, naked and distinct, may be beheld, is represented by figure in the fourth Table.

And truly, this Position or Aspect of the Brain, to wit, when its hinder border or partition, being freed from its cohesion by the Membranes to the oblong Marrow, and elevated, is bent forward, exposes to be seen by the eyes themselves, its whole frame or substance, to wit, whatever it hath without or within, or before and behind, and also plainly detects what its habitude and respect is to the other parts. The chief things of these I shall add, and in the same order wherein they occurred to Inspection.

The figure of the Brain, especially in a man, shews somewhat globous or spherical: the outward superficies is on all sides noted with chinks turning and winding like to the rollings about of the Intestines: each breach or Involution, yea the whole circuit of it contains a twofold substance, viz. the Cortical or rindy, which is the outmost and of an Ash-colour; and the medullary or marrowy, which lyes under it, and appears white. The Brain being as it were plowed with these kind of rollings about, like so many ridges and furrows, is cleft in the middle, and parted as it were into two Hemispheres; yet both the moities come together, and are as it were founded in one like white substance, which covers inwardly, and as it were in Chambers or Vaults, the whole bulk of the Brain. This is harder than any other portion of the brain, and as it is altogether medullary; it receives all the marrows of the circumvolutions within it self, and is to them instead of a common basis. In either Hemisphere of the Brain, about the fore parts, this callous body or marrowy substance, becomes more firm and thick by far than in any other place; and there it is on both sides fastened to the tops of the oblong Marrow. From those tops, as it were its beginning, this medullary substance, covering over or chambering or arching the Brain, is stretched out towards the hinder parts, and by degrees lessens in its thickness: at length the outward border of this stretched out, is drawn together more narrowly, and more below, it is conjoyned by the knitting of the Membranes and Vessels (as we but now mentioned) to the tail of the oblong Marrow. Besides, for its more firm connexion, a medullary process arises from the fore part of the callous body towards the tops of it, which stretching under the fissure or cleft of the brain, reaches to its border; to which it is united, as it were with arms bending on either side: which arms indeed embrace the tail of the oblong Marrow, and so more firmly knit to it that border of the Brain.

This medullary process, commonly called the *Fornix*, under its rise or beginning, hath two white and medullary roots, either of them alike going out from the callous body, which roots nigh the tops, where the brain is hung to them, meeting together, pass into the *Fornix* or Vault it self, as if it were a broad process, which stretches under the chamber of the brain, like a beam. Under this twofold root of the *Fornix* is laid cross-wise, of the same magnitude, a medullary trunk, by which, like a bridge, there is a certain passage and communication between two processes of the form of a Lentil, and chamfer'd or furrowed bodies beaming or shining in them. Further, from the midst of the superficies of this *Fornix*, a thin and pellucid hedge or pale is erected, which is affixed to the chanel or furrow of the callous body, almost along its whole passage. And for this reason, whilst the three-sided *Fornix* stretched underneath a chamber, arising from the complication of the brain, it distinguished its appearing cavity as it were into three partitions, and so caused, that in it three Ventracles were represented.

The interior recesses of the Brain will lye yet more clearly open, if the border, being on every side separated and lifted up, as much as may be, from its cohering with the oblong Marrow, be cut a little further through the substance at the sides of the same Marrow, to which it is united, nigh the chamfer'd bodies, and also the *Fornix*, being cut nigh the roots, be bent back, together with the brain; for then the frame of the brain may be wholly lifted up, turned forward, and unfolded into a plain, so that the whole interior superficies of the callous body being stretched out into a broad floor, may be seen and handled. Where, besides the medullary, and its most white substance, may be observed many white parallel lines, which cut the partition of the Brain in right angles, as if they were certain tracts or footsteps, in which the animal Spirits travel from one Hemisphere of the Brain to the other, and return back again.

After this manner, in very many perfect four-footed Beasts, the frame or substance of the Brain was wont to be turned over, the Sphere being projected into a plain, and its interior superficies to be unfolded into breadth. Also this kind of Method of Dissection may be used in a mans brain, where the same *Phænomena* wholly occur to Anatomical observation. The chief difference is, that the bulk of the brain of a man, for that it is very large, and also far thicker, and endued with more turnings and windings; therefore it cannot be so easily and thoroughly inverted, as that of a Calf or Sheep, and reduced into a broad plain: yet it may be so far expanded and lifted up near its border or partition, that all the interior recesses may appear in view. The third and Fourth Figures shew the image of an humane brain bent back; but in the seventh Table is shewn the aspect or sight of a Sheeps brain wholly unfolded, and as it were spread plain.

In the lesser four footed Beasts, as a Mouse, an Hare, Coney, and some others, the superficies of the Brain being wholly plain or even, wants the turnings and windings; however from the complication of the border, and the under-stretching of the *Fornix*, there results a cavity representing Ventracles.

After that we have thoroughly viewed all things which belong to the Brain, in the order as we have said, let either Hemisphere, covered within with the callous body, by which it hangs, be divided and removed from the tops of the oblong Marrow: which indeed may be exactly done, by cutting it near to the sides of the Lentiform prominencies, which are found in the vulgar dissection of the Head, within the interior Ventracles: for those prominencies are the tops or heights of the shanks of the oblong Marrow, to which the callous body is immediately fixed. When the brain is cut after this manner, that the prominencies, which are the tops of the shanks of the oblong Marrow, may be left naked, let them be cut long-ways through the midst (to wit, in the medullary part, where they are conjoyned to the callous body) and their interior substance will appear through the whole chamfered or streaked; viz. medullary streaks or chamferings are seen to ascend and descend forward and backward; that none may doubt, but that these chamferings or streaks were made by Nature, as it were passages or chanel for the passage and return, or going to and fro of the Spirits out of the callous body into the oblong Marrow, and on the contrary. The Figure of the shanks of the oblong Marrow, divided from the Brain, with their tops, which are the chamfered bodies, is expressed in the eighth Table.

After these striated or streaked bodies, the shanks of the oblong Marrow being divided for a little space, go forward, then being united, they meet together in the same stock, made up as it were of two stems. But the stock or trunk of the oblong Marrow in its whole tract, viz. before and after the coalition of its shanks, hath many Processes, Appendices, Prominences, and Insertions of Vessels, some of which arise from one side, and others from the other side, and make it unequal, with various productions and protuberances; of which hereafter.

The First Figure.

S Shows the Basis of an humane Brain taken out of the Skull, with the Roots of the Vessels cut off.

- AAAA. The anterior and posterior Lobes of the Brain quadripartite or divided into four parts.
- BB. The Cerebel or little Brain in the hinder part of the Head.
- CC. The long Marrow or Pith.
- DD. The smelling Nerves or the first pair.
- EE. The Optick or seeing Nerves the second pair.
- FF. The moving Nerves of the Eyes the third pair.
- GG. The pathetick Nerves of the Eyes, or the fourth pair.
- HH. The fifth pair of Nerves.
- II. The sixth pair of Nerves.
- KKKK. The auditory or hearing Nerves, and their two processes on either side of them, the seventh pair.
- LLIII. The wandring pair, or the eighth pair, consisting of many Fibres.
- MM. The Spinal Nerves coming from afar to the origine of the wandring pair.
- NN. The ninth pair consisting also of many Fibres, (which tending downwards, grow together into one Trunk) which arises a little above the process of the hinder part of the Head.
- OO. The tenth pair tending downwards.
- PP. The Trunk of the Carotidick Artery cut off where it is divided into the anterior and posterior Branch.
- QQ. A Branch of it going in between two Lobes of the Brain.
- R. The anterior Branches of the Carotides go away united, moving forward into the fissure or cleft of the Brain.
- S. The posterior Branches of the Carotides united, and meeting with the Vertebral Trunk.
- TTT. The Vertebral Arteries and their three Branches ascending.
- V. The Branches of the Vertebrals growing together into one Trunk.
- WW. The place designed where the Vertebrals and the Carotides are united, and either Branch ascends to the Choroidal infolding.
- X. The Tunnel.
- YY. Two Glandula's or Kernels placed behind the Tunnel.
- aaaa. The annulary Protuberance, which being sent from the Cerebel, embraces the stock of the long Marrow.

The Second Figure.

Shows the Basis of a Sheeps Brain taken out of the Skull, and the Roots of the Vessels cut off, where all the Arteries, by Ink being injected into one of the Carotides, are made black and more conspicuous.

- AA. Two Hemispheres of the Brain without Lobes, different from that in a Man.
- BB. The lateral portions of the Cerebel.
- CCC. The oblong Marrow.
- DD. The olfactory or smelling Nerves cut off nigh to the mammillary Processes, that their Cavities may appear.
- E. The Coalition or joyning together of the Optick Nerves.
- FF. The motory Nerves of the Eyes, or the third pair.
- GG. The Pathetick Nerves, or fourth pair.
- HH. The fifth pair: the Trunk of which Nerve is presently divided into two Branches.
- II. The sixth pair.
- KK. kk. The seventh pair, or the hearing Nerves, on either side of which are two Processes.
- LL. The eighth or wandring pair, the origine of which is made up of very many Fibres seeming to grow together.
- MM. A Nerve coming out of the spinal Marrow to the beginning of the wandring pair.
- NN. The ninth pair, consisting also of divers Fibres arising distinctly, which afterwards grow together into one Trunk.
- OO. The tenth pair tending downwards.
- PP. The Trunk of the Carotidick Artery cut off, where it is divided into the anterior and posterior Branch.
- QQ. The inosculation of the anterior Branches.
- R. The posterior Branches of the Carotides united, and meeting with the Vertebral Trunk.
- SSS. The Vertebral Artery ascending with a triple Branch.
- TT. Where the Carotides meet the Vertebral, and on either side many Arteries ascend to the Choroidan infolding.
- V. The coalition or joyning together of the Vertebral Branches into the same Trunk.
- W. The Tunnel.
- X. A white Glandula or Kernel placed behind it.

CHAP. II.

The Parts of the oblong Marrow, and the rest of the hinder Parts of the Head are recounted, and their Dissection shewn.

HAVING described both the Meninges, and the ramifications of the Vessels in them, also the fabric of the Brain, properly so called; and next shewed its outward partition gathered together into folds about the shanks of the oblong Marrow, and either middle or marrowy part of it hung to the chamfered bodies; we will now follow the remaining parts of the Head in order.

The chamfered or streaked bodies, or the tops of the oblong Marrow, are two lentiform Prominences, which are beheld within the former Ventricles of the Brain, as they are commonly termed; the heads of these, which are more large and blunt, incline mutually one to another, and are almost contiguous. Out of the angle of this inclination the *Fornix* arises with a double root; to which is subjected or underlaid a certain transverse medullary process, and seems to knit together these streaked bodies, as may be seen in the seventh Table GG. but the ends of those bodies, being made sharper, are reflected outward, and make as it were two sides, with a sharp triangle, to whose anterior superficies the marrow of the callous body sticks for a long tract; where, if these bodies be cut long-ways through the midst, the medullary streaks (as was already said) will presently appear. The figure and place of these, as also the medullary chamferings, are truly represented in the eighth Table.

Where the streaked bodies end, the chambers or *Thalami*, as they are termed, of the Optick Nerves, possess the next part to the oblong marrow; to wit, in this place, its shanks rise into unequal protuberances, out of the ridges of which the Optick Nerves arise, and from thence, being bent down in the fore-part with a certain compass, they joyn together about the base of the same marrow, and seem to be united; by and by being again parted, and going forward towards the ball of the Eye, they go out of the Skull. In this place the shanks of the oblong marrow in a Man are for the most part distinct, and gaping one from another, leave a descending opening, which is in the passage to the Tunnel; but in most four-footed Beasts the shanks of the same medullary stocks are there distinct, only a little lower, and have a chink cut for the Tunnel: but the ridges of them, in which the beginnings of the Optick Nerves lye hid, are somewhat conjoyned, and for the space of half an inch do grow together. Wherefore in Brutes there is one hole before this growing together, and another behind it, both which lead towards the Tunnel. The reason of this difference is, because in a Man, for that the frame or Substance of the brain it self is very large, and that its marrowy parts are remote one from another, it is behoveful for its shanks, whereby the tops of the oblong marrow may be the better fitted to the same, to be separated, and from their mutual touching to be bent into a greater aperture. Hence it is observed, that in a Man the shanks of the oblong marrow, from the hanging on of the Brain, go forward with a greater angle of inclination, and with a certain bending compass; but in Brutes the same lye almost parallel. After what manner these parts are formed in an humane brain the third and fourth Figure shews; after what manner they are in four-footed Beasts is shewn in the seventh Figure.

From the same ridges of the medullary shanks, from whence the Optick Nerves take their origines certain medullary processes arising, and being dilated on either side above the brim of the second hole, grow together about the root of the pineal *Glandula*. These processes (as it seems) are those parts, which the Famous *Carter* supposes to be Nerves belonging to the pineal *Glandula*: but I rather suspect them to be productions only, by which the Optick Nerves may also communicate near their origines. Their figure is very well described in the seventh Table.

After the *Thalami* or Chambers of the Optick Nerves, other notable protuberances, commonly called *Nates* and *Testes*, the Buttocks and Testicles (of the brain) grow to the superior part of the medullary Trunk or stem, and cover its superficies about the space of an inch; and for that they are not contiguous in the midst, there is under them a certain hollownes in their whole tract. These protuberances are lesser in a Man, also in a Dog and Cat; lastly, if we observed rightly, in other living Creatures, which are newly brought forth, that are impotent, and not instructed for the finding out of food. In a Calf, Sheep, Hog, and the like, they appear far greater: in Fishes and Fowls they are wholly wanting.

In number they are four, viz. two grow to either side of the oblong marrow. The former called *Nates* or the Buttocks, seem the greater and principal; to which the other latter called *Testes* or the Testicles, hang as if growing out of them. As to their figure, they are round, and are commonly taken for two shanks on either side of the Brain and Cerebel planted near, which being bent inwardly, and turned back one towards the other, are said to grow together, and so to constitute the oblong marrow. But this opinion, as we shall shew more largely hereafter, by the dissection ordered according to our Method,

is clearly false. For it plainly appears, that the Brain is fixed, long before these bodies to the oblong marrow; nor is there any commerce between these and that, unless very remote.

But if the site of these parts, and their respects and habitudes to the neighbouring bodies, be well noted, it will appear plainly, that they make as it were a certain peculiar Region wholly distinct from the Brain and Cerebel, also from the oblong marrow itself. Their situation is more remote enough from the fore parts, and sufficiently separated by the Cavity or Ventricle, underling from the medullary Stock or Trunk. Yea a proper way, or one process, seems to lead from the oblong marrow into these prominences, and another to go from them, and thence to be carried into the Cerebel. From hence we may suspect, that these prominences (especially the Nativiform, or of the shape of a Buttock, which are the chief) are certain places of diversion, in which the Animal Spirits go apart in their passage from the oblong marrow into the Cerebel, and from thence to that one or other side, and there stay for some animal uses, of which we shall speak hereafter. And as to the Nerve, which leads from the oblong marrow into these prominences, it is manifest, that beneath the origins of the Optick Nerves on either side a medullary Process descends, with little Villages proper for it self, which terminates in the aforesaid prominencies. Then, if from these you look sovera passage out, it is equally clear, that from the hindermost prominencies, which are called *Testes*, on either side, a medullary process doth obliquely ascend, which being dilated into the Cerebel, is diversified through its whole frame. But that the Nativiform or Buttock-formed Prominences are Principals, and the *Testes* their dependences, or the heads of medullary Processes, which are carried from thence into the Cerebel, manifestly appears in a Sheep, Calf or Horse, and in some others, where the *Nates* are of a noted magnitude, the *Testes* of a very small bulk grow to them, and in the middle between these the medullary Processes, the Appendices of the former Prominences, exist. The aforesaid Prominences, as also the medullary Processes, which lead forward and backward, to and from them, are aptly represented in the fourth Table, but yet more clearly in the eighth Table *II. PP.*

Further, because the Animal Spirits residing in either Promontuary and Appendix, before they are carried to the Brain, ought to be confounded and mingled together, therefore the two prominences of either side do mutually grow together as it were with wings stretched out one to another; but for as much as it is behoveful for those growings together to be distinguished from the oblong marrow, therefore an hollowness comes between, which is by some esteemed the fourth Belly, and by others a passage to it. These Prominences in a Man, Dog and Cat, and some other Animals (as was above mentioned) are very small, and almost even; also they appear, as the other portion of the oblong marrow, of a white colour. In a Calf, Sheep, Horse, and many other four-footed Beasts, the former protuberances, commonly called *Nates* or Buttocks, are remarkably great, also outwardly they appear to be of a flesh colour, because they are clothed with the thin *Meninx* or *Pia Mater*, which contains in it self very many Veins and Arteries; which if separated, the interior substance of those parts is of a wannish colour, and such as is not in all the oblong marrow or pith besides. But it plainly appears, as in Brutes, so in Man, the hinder or posterior prominences are *Epiphyfes* or additions of the former, and that from these additions or dependences the medullary processes ascend obliquely into the Cerebel; near which, other processes cutting those descend direct from the Cerebel, which seem not to be inserted into the medullary Trunk, but going about it, do constitute the annular or ringy protuberance. This annular protuberance is greater in a Man than in any other Creature. Besides, it is observed, that where-ever the superior prominence of the Buttock-form is larger, this inferior annular is very small; and so on the contrary. Further, those medullary processes, ascending towards the Cerebel, communicate mutually among themselves by the other transverse medullary process; and out of this transverse process, two small little Nerves arise, the fourth pair of those which we have recounted, and which are called by us *Patherical*. Each of these, delineated in fit figures, the seventh Table shews clear enough.

Not far from the aforesaid Prominences, to wit, between these and the Chink, which is called the *Anus* or Arse-hole, the Pineal Glandula or Kernel is placed. This is put in a Valley, which lyes between the Nativiform protuberances, and those which are the Chambers or *Thalami* of the Optick Nerves; in which place that Glandula or Kernel is fixed, sometimes by very many small Fibres, and sometimes by two noted medullary roots subjected to the part; and besides it is included in a Membrane, which is a portion of the *Pia Mater*, as in a Chest; and as this Membrane is stuffed with very many Arteries and Veins, some small Vessels also enter into this Glandula.

Under the Prominences but how described, (as was above hinted) a narrow Cavity or Ventricle is stretched out with a long passage, which, although it obtains some egregious uses, yet it self seems to be only secondary, and as it were by chance; for that the processes of either prominence ought to be conjoynd among themselves, and to be distinguished from the under-lying medullary Trunk. Two holes lye open into this Trunk, one of which is placed in the beginning, and the other in the end of it, and through the middle of its passage the down-bending aperture tends towards the Tunnel; so that the serous humor entring at either hole, may presently slide away into the Tunnel. Moreover, into the same aperture of the Tunnel there lyes open another passage, to wit, through the first hole, which is placed near the roots of the *Fornix*; so that from every quarter of the Head the seronities

refities might be carried into that sink ; to wit, that through the first hole, from the infoldings or the anterior Ventricles of the Brain ; through the second hole, the humors which are gathered about the orbicular prominences, do come away ; and through the third hole, those which are laid up nigh the confines of the Cerebel, do find a passage. These several holes, with the distinct ways to the Tunnel, are plainly delineated in the seventh Table H. M. T.

Above the Pincal Kernel, as it were above the Button, the infolding of the Choroides seems to be hung ; now this infolding is made after this manner : out of either side of the oblong marrow, where the border of the Brain is knit to it, two Arteries arising from the posterior branches of the Carotides, where they are united to the Vertebrales, do directly ascend ; which being presently divided, like many Rivers planted near together, are carried towards the pincal Glandula, and there seem to be terminated by a mutual meeting ; and in that place, out of the fourth bosom, sent down upon the pincal Glandula, the venous branches come out on both sides, which in like manner being divided into filaments or small threads, meet with the capillary or hairy Arteries, and are in many places inoculated into them, and variously complicated with them ; and so these Vessels, being Net-like, much interwoven among themselves, and interserted with the Glandula's, do constitute the to be admired infoldings. These kind of infoldings of the Vessels, as it were with two out-stretched wings, are thrust out on either side upon the shanks of the oblong marrow, even to the streaked bodies ; but yet they only lie upon their superficies, nor are they more firmly affixed either to the oblong marrow, or to the callous body by any insertions of the Vessels ; so that the blood seems only to be brought to these places, and carried away without any afflux of it made into the subjected parts ; for what uses shall be spoken of hereafter. The Choroidal infoldings, with the pincal Glandula, are drawn out in the seventh Table. G. F. E.

And thus far concerning the appearances found above the oblong Marrow, between the streaked bodies and the Cerebel ; which indeed are almost constantly after a like manner both in Man and four-footed Beasts, unless that they only differ in bigness. Within this space, in the Pedestal or Basis of the same Marrow, many things worth noting occur : For besides the ends of the cut off Vessels, which are above recited, the site and structure of the Infundible or Tunnel deserve consideration. For behind the coalition or joyning together of either Optick Nerve between the shanks of the oblong Marrow there gaping, is sent down a receptacle as it were tubulated or made like a Pipe, covered without with a thin Membrane arising from the *Pia Mater*, and defended within with a medullary substance. The orifice of this is placed higher, between the shanks of the oblong Marrow, and receives their bending aperture ; from thence a short Tube or Pipe being sent down, is inserted to the pituitary Glandula or Kernel. We see this Tube in an Horses Brain greater than a Gooses Quill, also shining and full of clear waters ; that it is not to be doubted, but that by this way the serous humors slide away from the Brain to the pituitary Glandula : but how these humors are carried away from thence, shall be afterwards inquired into, because they are not carried into the Palate or Roof of the Mouth, as is commonly believed.

Nigh the lower border of the Tunnel, in a Man, underneath there are two whitish Glandula's, though in Brutes only one, but greater, is found. What is the proper use of this part shall be told hereafter : in the mean time, whether it be doubled or only one larger, it seems to be as it were instead of a bank to defend or preserve the thin Membrane of the Tunnel, lest it should be broken or thrust out of its place : on the other side the growing together of the Optick Nerves serves instead of the same kind of defence.

What besides is contained in this space are only the shanks of the oblong Marrow it self, which proceed directly from the chambers of the Optick Nerves towards the hinder part of the Head in a straight passage ; and when both grow together below the Tunnel, they are afterwards distinguished in their whole tract by a line drawn through the midst. These shanks of a mans Brain are far larger than in brute beasts : to wit, in that they seem to be made up of very many medullary cords or strings joyned together in one, as if in this common passage and high-way of the animal Spirits, they were so many distinct paths, which the Spirits enter into respectively, according to the various impulses of sense and local motion. Moreover, this space of the oblong Marrow therefore appears shorter and more broken in a man, because much of it is hid by the annular protuberance, which is sent from the Cerebel, and is very big. The *Pia Mater*, all about covering the sides of this medullary Trunk, cloaths them with most thick infoldings of the Vessels ; by which heat and the nervous juyce are carried, as a continual provision for the Spirits, taking a long journey. Thus much for the first Section, or anterior portion of the oblong Marrow : now our order carries us to the inspection of its hinder Region, to wit, where the Cerebel grows to it ; and the Processes sent from this either compass about its Trunk, or are inserted into it ; out of which also, the other Nerves produced within the Skull, take their beginnings. Concerning these we will speak in order.

CHAP. II.

A Description of the Cerebel and its Processes; also of the hinder Region of the oblong Marrow.

BELOW the orbicular Prominences, the Cerebel follows to be inspected. The figure of this, like the Brain, is somewhat globous, also it appears unequal, marked with certain turnings and windings about; the ridges and furrows of whose turnings about the *Pia Mater* stretches over, and reaches out the infoldings of the Vessels to them all, and deeply inserts them into all. However the Cerebel is diversified or variegated with its turnings and rollings about, not as the Brain, after an uncertain manner; but its folds are disposed in a certain orderly series: for the exterior frame of it seems to consist of thin lappets, or little rings or circles, being contiguous and infolded, also going about through the whole compass with a parallel site or situation.

Either Region of the Cerebel, to wit, the former and the hinder, is terminated in a process in form of a Worm. According to these ends, as it were in a double Pole, these Circles are very short; thence ascending towards the top or Equator, they are by degrees enlarged, as it were Parallels in a Sphere or Globe. These Circles are outwardly Cortical or barks, and within medullary, and all their marrowy parts pass into two ample middles; which indeed seem to be the same in the Cerebel, as the callous body in the Brain.

The Cerebel in some Animals consists of one frame, and all its little circles are placed in the same parallel site, and keep the same proportion among themselves; but in others there grow to the Cerebel as it were the primary Sphere, and endued with greater circles, some other bodies as it were Wens or Exuberances, or additional Spheres marked with lesser circles. These being eccentric to the Cerebel it self, have oftentimes labels or folds ordered in a diverse series from it.

But the Cerebel it self (whether it hath these little Excrecences growing to it or not) is found almost in all Animals of the same figure and proportion, also made up of the same kind of labels or lappets. Those which have the Brain diversly framed from a Man, as Fowl and Fishes, also among four-legged Creatures, Conies and Mice, whose Brains want turnings about or convolutions, have the like species and the like disposition of the folds and compofure of the other parts of the Cerebel. The reason of this difference in the brain, and of the conformity in the Cerebel, is rendered hereafter, when we treat of the Use of the Parts.

As the Brain, within its Cavity, hath the Choroidal infolding made up of Arteries and Veins variously complicated, and of Glandula's thickly intertexted; so also the Cerebel hath got the like infoldings of Vessels, and those marked with very many Glandula's, and greater than those in the Choroidal infolding. These infoldings and heap of Kernels, the *Pia Mater* being separated, which clothes the hinder part of the Cerebel, easily appear in sight; for in that place these creep upwards on either side nigh the Worm-shaped process, as it were with two branches; and receive the Artery on either side, from the Vertebral Artery, lying under the Basis of the oblong Marrow and the veinous passages, sent from either lateral bosom. We shall inquire hereafter into the use of this infolding and of its Glandula's.

In the mean time, that we may describe the site and hanging on of the Cerebel; the same standing on the oblong Marrow seems to be fixed to its sides, as it were by two little feet; between which, planted on either side, and the Cerebel placed above, and the trunk of the long marrow below, (because all these should be distinct one from the other) there comes a cavity or hollowness between, which is commonly called the four Bellies.

In either little foot, sustaining the Brain, are found three distinct medullary Processes. The first of these, sent from the orbicular Protuberances, ascends obliquely; the second descending straight from the Cerebel, and passing through the other across, compasses about the oblong Marrow; the third, process, descending from the hinder Region of the Cerebel, is inserted into the oblong Marrow, and increases its trunk as it were with an additional cord or string. These several Processes are truly represented in the seventh Table. Q. P. R.

But as to what belongs to the annular or ringy Protuberance, by which the medullary Trunk, both in Man, and in some four-footed Beasts, is compassed about, that is made after this manner. The second or middle process of the Cerebel, descending straight to the oblong marrow, seems not to be implanted in it, as soon as it touches its sides, but growing into a larger bulk, goes about the superficies of the same Marrow with divers circular Fibres. And so when in either side both those kind of processes of the Cerebel, being dilated or carried from the top of the medullary Trunk towards its Basis, do mutually meet, they make that circular protuberance. The substance of this is far larger in a Man than in any other Animal, in an Hare, Rabbet, Moufe, and the like, it is very small; in Fowl it is either wholly wanting, or for its smallness scarce to be discerned by the eyes. Concerning its bulk, this is a constant observation. They who have the orbicular prominences before the Cerebel small, have this annular protuberance very big; and on the contrary, they who have those prominences big or very great, have this ring very small: further, they who wholly want the Buttock-form protuberances, as in Fowl, seem also to want this annulary.

In many brute Animals, but not in Man, nigh to this greater Protuberance, a little lower, another lesser, in like manner orbicular, stands, and compasseth about the superficies of the oblong Marrow; the root of which is a white and medullary line, stretched out under the Cerebel, above the bottom of the fourth Ventricle. From the sides of this lesser protuberance the auditory Nerves arise. In Man the auditory or hearing Nerves are seen to arise out of the utmost brim of the greater protuberance, in like manner they have for their root a white medullary line covering the fourth Ventricle.

That this line, and the three distinct medullary Processes, which constitute either little foot of the Cerebel, may be more plainly shewn, also that the most inward frame of the Cerebel may be viewed, its whole Globe ought to be cut through both Poles, viz. in the middle through the Vermiform or Worm-shaped processes; then it will plainly appear, that in either Hemisphere there is an ample middle or marrow, wherein the marrowy branches, being stretched abroad on every side, like those of a tree, spread through the Cortical substance of the Cerebel, every where diffused; and that in either middle or marrowy part, the three distinct processes, which make either trunk, or little foot of the Cerebel, are inserted. Each of these, are fitly represented in the seventh Table.

Thus much for the Cerebel, and by what means it is fastned to the oblong marrow. Beside these it is to be observed, that about the bottom of the Basis of the oblong marrow, out of the greater Ring, come out two medullary strings; which being distinct from the rest of the medullary Trunk, go right forward towards the spinal marrow, and in its progress, being made straiter by degrees, like Pyramids, after about the space of an inch, end in sharp points. The extremities of these consist on the other side, where the wandering pair of Nerves have their original, and make a certain rising up in the oblong Marrow. Hence it is likely, that these strings are passages or chancels of the animal Spirits, wherein they are carried from the greater Ring, or what is the same thing, from the Cerebel into the wandering pair, and the beginnings of other Nerves implanted near; for what end, shall be said hereafter. These pyramidal Bodies do not so manifestly appear so long as the *Pia Mater* clothes them, and hides them with the infoldings of the Vessels; but this Membrane being pulled away, they are so conspicuous, especially in a Man and a Dog, that they seem like greater Nerves. In those Animals, where the annular Protuberance is greater, these processes being brought from the same in right angles, are greater and more conspicuous; and on the contrary, in Fowl they are clearly wanting.

Concerning this hinder Region of the Head, there is not much besides worth noting, except the productions of the Vessels. But there are Vessels which chiefly belong to these parts, the latter six pair of Nerves arising within the Skull and the Vertebral Arteries. We have already described in some measure the beginnings of the former; what belongs to the more full knowledge of them, we shall leave to be handled in its proper place. As to the Vertebral Arteries, they reach from about the farthest end of the oblong Marrow, now about to end in the spinal, to its sides. These Vessels, as they are smaller, so they enter the Skull with lesser provision than the Carotides; for they are neither flourish'd first with Net-like infoldings, nor are carried in a long journey by compassing about; but either Artery, passing directly through the Cuneiform or Wedge-like Bone, embraces the medullary Trunk on either side. Although these go forward divided for a little space, yet afterwards they are united, and with a single channel or passage, they meet with the posterior Carotides inclining mutually one towards the other; and so all the branches, meeting as it were in a threefold way, are inoculated one in another. The Vertebral Arteries, first shewing themselves within the Skull, are disposed otherwise in Brutes than in men; in the latter they fall through the sides of the oblong marrow parallel for some space, then as it were with a certain semi-circular compass, they mutually incline one towards the other, and presently meet. The branches which first go forwards divided, are sometimes only two, to wit, one on either side, sometimes three, and then besides the two former, another is produced in the middle. But in Brutes, either Trunk of the Vertebral Artery, at the first coming to the Marrow, inclines presently to the meeting of the other with an acute angle, and quickly both meet together. The *Vertebals*, even as the *Carotides*, send forth manifold branches in their progress with an innumerable series of shoots, which cover over the oblong marrow, the Cerebel, and all their cavities and recesses, and water them all with a plentiful flood of blood.

These are the *Phænomena* or Appearances which the whole frame of the Brain and its Appendix is wont to exhibit to Anatomical Inspection, and which, as to its fabrick, and all its parts, and processes, are to be found both within and without. As it is a hard and troublesome business to inquire into the actions and use of each of these, so it is also joyned with so much pleasure and profit, that I dare promise to my self and others, that it will be a thing worth our labour and while. Yet before we enter upon this, there remain to be unfolded some things hid in some of the bones of the Skull, such as are the pituitary Kernels, the admirable Net, and some others; also we ought to shew first, briefly at least, a type or figure of the Brains in Fowl and Fishes.

The Third Figure.

Shews the outmost or superiour Superficies of the humane Brain taken out of the Skull; where the border of the Brain being loosned from the knitting of the other Parts, made by the Membranes, is elevated and turned outward, that the shanks of the oblong Marrow, the Fornix or arched Vault, the Nates and Testes, with the pineal Kernel, and other Processes, may be clearly and distinctly beheld.

- AA. The border of the Brain, which in its natural situation was contiguous to the Cerebel.
- B. The brim or margent of the callous Body besmearing either Hemisphere of the Brain, which in its natural site leans upon the pineal Glandula.
- C. The Fornix or arched Chamber.
- DD. The Arms of it embracing the shanks of the oblong Marrow.
- EE. The shanks of the oblong Marrow, out of which the Optick Nerves proceed; and the tops of which (situated further out of sight) are the streaked Bodies.
- F. The pineal Glandula, between which and the root of the Fornix, stands the chink leading to the Tunnel.
- GG. The orbicular Protuberances which are called Nates or the Buttocks.
- HH. The lesser Protuberances called Testes or the Testicles, which are Excrescencies of the former.
- II. The medullary Processes which ascend obliquely from the Testes into the Cerebel, and constitute part of either of its Meditullium or marrowy part of it.
- K. The meeting of those Processes through another transverse or cross Process.
- LL. The beginning of the pathetick Nerves out of the meeting of the aforesaid Processes.
- MM. A portion of the oblong Marrow lying under the aforesaid Processes and Protuberances.
- N. The hole of the Ventricle or Cavity which is placed under the orbicular Protuberances.
- OO. A portion of the annulary Protuberance sent from the Cerebel, and embracing the oblong Marrow.
- PP. The outmost and upper superficies of the Cerebel.

The Fourth Figure.

The Effigies of an humane Brain of a certain Youth that was foolish from his birth, and of that sort which are commonly termed Changelings; the bulk of whose Brain, as it was thinner and lesser than is usual, its border could be farther lifted up and turned back, that all the more interior parts might be more deeply beheld together.

- AA. The border of the Brain lifted up, and very much bent back, which in its natural site, being knit to the oblong Marrow, nigh the Cerebel, did hide the Nates and Testes.
- B. The border or inferior margent of the callous Body.
- CC. The Fornix, with its two Arms, embracing the shanks of the oblong Marrow.
- DD. The internal cavity or hollownes of the Brain resulting from the folding together of its border about the oblong Marrow.
- EE. The tops of the shanks of the oblong Marrow, or the streaked or chamfered Bodies.
- FF. The Chambers of the Optick Nerves.
- G. The pineal Kernel, between which and the root of the Fornix the hole is, whose passage leads both to the Tunnel, and to the Ventricle lying under the orbicular Protuberances.
- HH. The Protuberances called Nates.
- II. The Protuberances called Testes.
- KK. The medullary Processes stretching out from the Testes to the middle of the Cerebel.
- LL. The laid aside Hemispheres of the Cerebel cut in two through the midst, that the Trunk of the oblong Marrow may be the better seen, where its medullary substance branches out into the form of a tree.
- M. The Furrow below the medullary stock, which being covered by the Cerebel, makes the fourth Ventricle in the form of a writing pen.
- NN. The medullary Processes which seem to be passages out of the oblong Marrow into the orbicular Protuberances.
- O. The end of the oblong Marrow giving place to the spinal.

CHAP. IV.

The Parts and some of the Contents of the separated Skull unfolded.

IT is not our intent, nor will it be needful for us to delineate the figures and situation of the several Bones of the Brain-pan, or to describe their various holes, which transmit the Trunks of the Vessels like the hanging weights of a Clock. All these are well enough known; so that to treat of these Gates or Entries is superfluous. Besides also, by what means the Nerves, arising within the Skull with their ramification or branching forth, enters the dens and caverns of the Bones, shall be delivered particularly afterwards. Wherefore for the present our business shall be only to take notice of some things, chiefly worth noting, concerning the sanguiferous Vessels passing through the Cuniform or Wedge-like Bone, not sufficiently noted by others.

Among the various uses and offices which the Cuniform or Wedge-like Bone yields to the Brain and its Appendix, it is not of the least note or moment, that it transmits the Carotidick Arteries, not without a certain mechanical or artificial provision; and that in the middle way, by which they must pass, it contains the pituitary Kernel, and sometimes the wonderful Net. Each of these deserve consideration; the more, for that in divers Animals they are after a different manner; and because it is much controverted among Physicians concerning their frame and use. But we will first speak of the pituitary Glandula, because this part, being placed higher, is observable to Anatomical Inspection before others.

The pituitary Glandula or snotty Kernel is hid within a proper Cell or stall, made hollow in the middle of the Wedge-like Bone, being shut up in the Chest sometimes more strictly, sometimes more loosely: For in a Dog, Cat, and some other Creatures, sticking to the Tunnel, it is pulled away together with it when it is removed; and then its bulk consists of two Glandula's or Kernels distinct among themselves, and easily to be separated one from another. But in a Calf, Sheep, Hog, and many others, it is strictly included on every side, except where it admits the Tunnel, and clothed with the hard *Meninge* or *dura Mater*, and with its coverings shut up between the cavity of the Bone. Besides, in these, its frame or substance seems but one and undivided, though, in truth, it is made up of a substance which is of a twofold nature or kind.

This Glandula is found in all perfect Creatures; for Man, all four-footed Beasts, yea Fowl or Fishes are provided or endued with it: from whence we may conclude it to have some necessary uses in the Brain. But as to its quantity or bigness, its proportion is various in divers Animals, according to the bigness of the head and body wherein it is; because in a Lamb it is greater than in a Man or Dog; also its bulk in a Horse is lesser than in an Ox. But the reason of this difference seems to consist in this chiefly, for that the pituitary Glandula in some, respects the bulk of the brain only laid upon it, and in others both the brain and the Carotidick Arteries ascending near it; and so as it hath a respect to both these together, or only to one, its substance or bulk is either greater or lesser. For truly in some Animals the Carotidick Arteries being dilated within the Skull, are presently divaricated into Net-like infoldings, and from those infoldings many shoots of the Vessels every where enter this Glandula, and are interwoven into its substance. Further, because this infolding of the Vessels, called the wonderful Net, is found very large in some, and in others very small; therefore this Kernel, for as much as it admits from these, few branches, and from those far more, and in some other Animals scarce any shoots from the Arteries, answers to this divers distribution of the Vessels, with the various proportion of its bulk. Because it is observed in some Animals, as chiefly in a Man and a Horse, that this wonderful Net is wholly wanting; and whereas in such, either Artery is carried about by a long compass between the recesses of this bone; from its trunk in a man sometimes one or two shoots, sometimes none, are carried into the pituitary Kernel; also in an Horse fewer branches enter into it, and so its bulk in these becomes lesser.

But in very many other Animals (especially those who have the wonderful Net) it may be proved, besides ocular inspection, also by this Experiment, that many sanguiferous Vessels enter this Glandula; for if an inky liquor be squirted into the Carotides with a Syringe, the exterior part of the Glandula, that is interwoven with the blood-carrying Vessels, will be very much dyed with a black colour. Wherefore without doubt, it may be thought, that this Glandula doth receive into it self the humors, to wit, flowing into it from the Tunnel in all kind of living Creatures, and in some from the branches of the Carotides. Yet by which way these humors are carried away again, doth not so plainly appear; for we affirm, with the most Learned *Schneider*, that they do not at all fall down into the Palate through the holes of the under-lying bone. Yet in the mean time, we suppose those holes to be only made to procure lightness to the bone; because in those Animals, which have the greater pituitary Kernel, those holes in the bone are more and larger: further, I have often found Vessels or Channells to be contained between those holes; and when I had injected Ink within the

the great hole of the same bone in a Calf, the black liquor presently entered the lesser Vessels subject to the bone, and at last the Jugular Vein. And by this Experiment chiefly we conjecture concerning the office and duty of this Glandula; of which we shall speak more fully hereafter, when we inquire into the use of this and the Tunnel.

Nigh to either side of the pituitary Kernel, if the *dura Mater* be opened, the Carotidick Artery lyes stretched out upon the wedge-like bone, about the length of an inch: for as this Artery rises up below the Turkey-Chair, sometimes higher, sometimes farther within the Skull; the same being presently bent in from its first ascent, goes in under the *dura Mater* till it comes to the anterior border of the same Chair; where again being intorted, and being sent forth upwards with a certain compass, it perforates the hard *Meninx*, and is carried straight towards the Brain. So this Vessel with its double ascent and crookedness (to wit, above the Basis of the Skull, and then above the hard *Meninx*, together with its situation, stretcht out in length under the same) represents in most the letter \hookleftarrow inversed; but in a man (as shall hereafter be more largely shewn) its site, by reason of the longer tract of the Vessel and its greater curvature, represents the same letter double after this manner $\hookleftarrow \hookleftarrow$.

The Carotidick Artery in all Animals ascends obliquely within the Skull, but as to its site or protension nigh the pituitary Glandula, it is not after the same manner in all: for in a Man passing through the Canal-bone, peculiarly ingraven by it, with a single Trunk, it lyes every where stretched out at length; and out of this Trunk it sends forth sometimes, though not always, some shoots to the pituitary Glandula. Also in a Horse, its Trunk is single; but where it first arises within the Skull, either Carotides, through the cross branches sent from one side to the other, before they perforate the *dura Mater*, communicate among themselves. And as in most other living Creatures, the Artery, however before branched forth, yet being made one single Trunk, goes into the Brain; in a Horse either Carotick Artery being parted in two, sends forth upwards two branches, arising from the *dura Mater*, in two distinct places.

In a Dog, Fox, Sheep, Calf, Stag, and many other four-footed Beasts, either of the Carotides, whilst hid within the Skull under the *dura Mater*, being divided into small shoots, and complicated with other Vessels, to wit, both Veins and nervous Fibres, constitutes the Net-like infoldings; which infoldings, being stretched out on either side of the Turkey Chair, fill the cavity there existing; then after manifold divarications of all the Vessels, some arterious shoots being disintangled from the others, and again united, grow together into one Trunk, which boring thorow the *dura Mater*, passes straight into the Brain.

The aforesaid infolding is, commonly called the wonderful Net, and that deservedly, for there is nothing in the whole fabrick of the animal Body more worthy of admiration; in which, besides the arterious little branches which proceed from either of the ascending Carotides, the veinous shoots, though fewer, meet with those descending from the inward Jugular branches; and both kinds of Vessels being divided into small shoots, like a bundle of twisted silk, are variously folded together; which complications of the Vessels however are sustained by the nervous Fibres, supplied from the greater Trunk of the fifth pair of Nerves. The aforesaid infolding of the Vessels or wonderful Net in some Animals is far greater, and contains much more divarications of the Vessels than it hath in others; for in a Calf, Sheep, Goat, which are fed with grass, its frame is larger than in a Dog, Cat, and other flesh-eating and hotter Brutes. Further, it is observable, where the wonderful Net is greater, that the infolding of one side is ingrafted into the infolding of the other opposite side, and that from both, many more shoots of the Vessels do enter into the pituitary Kernel; so indeed, that if you shall inject Ink into the Trunk of the Artery below the Skull, the Vessels on either side, or the infoldings, will be dyed with the same tincture, and the black liquor will flow out of the Trunk of the opposite Artery.

In truth we have often seen this kind of Experiment repeated. Let the Carotidick Arteries be laid bare on either side of the *Cervix* or the hinder part of the Head, so that their little Tubes or Pipes, about half an inch long, may be exhibited together to the sight; then let a dyed liquor, and contained in a large Squirt or Pipe, be injected upwards in the trunk of one side; after once or twice injecting, you shall see the tincture or dyed liquor to descend from the other side by the trunk of the opposite Artery: yea, if the same be more copiously injected towards the Head, from thence returning through the Artery of the opposite side, it will go thorow below the *Præcordia*, even to the lower Region of the Body; when in the mean time, little or nothing of the same tincture is carried thorow the outward and greater Jugular Veins. Then the Head being opened, all the Arteries, before the entrance of the Head, and the Veins of the same band with them, will be imbued with the colour of the same injected liquor. Further, in the Vessels which constitute the wonderful Net, and which cover the Basis of the Brain, some footsteps of the same tincture will appear. But that this liquor doth descend so plentifully by the opposite Artery, and not by the Jugular Vein, either associate or opposite, the reason is, because it cannot enter those Veins, unless the region of the whole Brain, being first passed thorow, it had entered the bosom; but the liquor being plentifully injected, could not so suddenly pass through the very small Vessels covering the Brain: wherefore rather than the force should be carried to the Brain by the violent impulse of the liquor, it returning from the injection, and otherwise threatening a flood to the Brain, finds the way

way of receding also by the opposite Arteries, for that end, both before they enter the Brain, and after they have entered it, communicating among themselves. And here we cannot sufficiently admire so provident (and to be equalled by no mechanical Art) a dispensation of the blood within the confines of the Brain. For in as much as the Carotidick Arteries do communicate between themselves in various places, and are mutually ingrafted; from thence a double benefit results, though of a contrary effect: because by this one and the same means care is taken, both lest the brain should be defrauded of its due watering of the blood, and also lest it should be overwhelmed by the too impetuous flowing of the swelling stream or torrent. As to the first, lest that should happen, one of the Carotides perhaps being obstructed, the other might supply the provision of both; then, lest the blood rushing with too full a torrent, should drown the channels and little Ponds of the brain, the flood is chastised or hindered by an opposite Emissary, as it were a Flood-gate, and so is commanded to return its flood, and haste backward by the same ways, and to run back with an ebbing Tide.

By this kind of provision the Arteries about to enter the Brain are provided: yea, and the passages of the Veins, destined for the returning of the blood from thence, seem also to be disposed with a wonderful artifice. For when the anterior bosoms transfer their load into the two Laterals, which are the posterior, and they themselves end in the Jugular Veins, it is observed, that those latter bosoms have furrows or cavities insculped whereby they may settle or rest upon the hinder part of the Head; and when as either bosom, through a proper hole, being about to go into the Jugular Vein, slides out of the Skull; nigh that hole, in the outward part of the Skull, a round and ample den is made hollow, and covered over by the extremity on either side of the same bosom, enlarged into a greater capacity, to the end, that the blood, whilst it slides forth out of the Head with a full torrent, should not rush into the Veins with too rapid and vertiginous an influx, and so make a forcible entry on the Heart it self, therefore it hath here a diversion large enough, in which effluating or boiling up, till a more free and open space may be granted to its course, it may be staid without any trouble. Certainly there can be nothing more artificial thought upon, and that can better argue the Providence of the great Creator, than this fit or convenient disposition of the blood in the brain, and without it, and the way of its reciprocation in divers Animals, accommodated to the necessity of every one. And lastly, in the dissection of Beasts, other miracles of the same nature happen, whereby shewing the Finger and Divine Workmanship of the Deity, a most strong and invincible Argument may be opposed to the most perverse Atheist.

The Fifth Figure.

S Hews the interior Basis of an humane Skull; where is shewn after what manner the Vessels of every kind cut off from the Brain, and about to go out of the Skull, are hid or laid up under the dura Mater.

A. The hollowness of the Bone of the Forehead.

B. The close or mound of the Cribiform or Sieve-like Bone.

CC. The mammillary Processes, which are much thinner, and endued with a less open cavity, than in four-footed Beasts, endued with a more excellent sense of smelling.

DD. The Optick Nerves, being far separated, go out of the Skull otherwise than in most brute Beasts.

E. The pituitary Glandula or Kernel with the top of the Tunnel inserted into it.

FF. The Carotidick Arteries shewing themselves nigh its sides.

GG. The moving Nerves of the Eyes going out of the Skull.

HH. The pathetick Nerves, hid under the dura Mater, go out from the Skull at the same hole with the former.

II. The fifth pair of Nerves hid under the dura Mater.

KK. The sixth pair stretched forth under the dura Mater, and go out also at the same hole with the third and fourth pair.

LL. The seventh pair entering with a double Process the stony Bone.

MM. The eighth or the wandering pair seen to grow together with an accessory Nerve of many Fibres, NN. as it goes out of the Skull.

NN. The accessory Nerve to the wandering pair.

OO. The ninth pair.

PP. The tenth pair tending downwards, hid under the dura Mater, where the Vertebral Artery ascends.

QQ. The lateral or Side-bosom.

The Sixth Figure.

Shews the Basis of a Calfs Skull; where is shewn after what manner the Vessels cut off from the Brain, and about to go out from the Skull, are drowned under the dura Mater.

AA. The hollownesse of the spongie Bone.

BB. The mammillary Processes, which, the smelling Nerves being cut off, appear hollow.

C. The Optick Nerves united, being presently separated again, they go out of the Skull.

D. The pituitary Kernel.

EE. The Carotidick Arteries emerging nigh its sides.

FF. The motory Nerves of the Eyes going out of the Skull.

GG. The pathetick Nerves of the Eyes, hid under the dura Mater, going out of the Skull at the same hole with the former.

HH. The fifth pair of Nerves demersed under the dura Mater.

II. The sixth pair drowned under the dura Mater, and going out at the same hole with the Fourth and Fifth.

KK. kk. The seventh pair entring the stony Bone with a double Process.

LL. The eighth pair, or the wandering pair, with many Fibres, and an accessory Nerve, seen to grow together, going out of the Skull.

MM. The ninth pair.

NN. The tenth pair tending downwards, hid under the dura Mater.

CHAP. V.

The Brains of Fowls and Fishes described.

WHat hitherto we have shewn concerning the description of the Brain and its Appendix, we chiefly owe to the observations made of the dissection of the Heads of a Man and of four-footed Beasts. We shall now proceed to the commenting upon these Observations; to wit, that we may endeavour, from the fabrick rightly considered of the parts of the Brain, so described, to erect their offices and uses, and so to design the government of the animal Function: But because a compared Anatomy may yield us a more full and exact Physiology of the Use of Parts; therefore before I enter upon this task, it will seem worth our labour to inquire into the Heads of some other Animals, to wit of Fowls and Fishes.

We have already hinted, that the Brains of Men and of four-footed Beasts, were alike in most things; and also that the contents in the Heads of Fowls and Fishes being far different from both the former, yet as to the chief parts of the Head, are found to have between themselves an agreement. The kinds of either Animals being coetaneous, and as it were Twins from the Creation of the World, do testify their affinity in nothing more than in the fabrick of the Brain. That it is so in Man and four-footed Beasts plainly appears already: we shall now see if that the Anatomy of Fowls and Fishes will shew us any thing worthy of note.

That we may begin with Fowls; the covering of the Skull being taken off, the hard *Meninx* or Membrane embraces strictly the bulk or mole contained within. In the midst of it, where the brain is divided into two Hemispheres, it hath a bosom stretched out at length, which notwithstanding, no *Falx* (or *Scythe*) being let down between the interstices, is inserted less deeply in the brain; then, where this Membrane distinguishes between the Brain and Cerebel, two lateral bosoms are formed. Besides in Fowls there is a fourth bosom, which hath its place a little more backward than in men or four-footed beasts; for a little below the pineal Kernel a hollow and smooth process of the hard *Meninx* is sent down upon the shanks of the oblong marrow, where presently it is divided into two branches, on either side whereof it sends forth one upwards into the cavity between the streaked Membrane and the Hemisphere of the brain, planted in the hinder part of the brain.

This superior Membrane or hard *Meninx* being cut off, and separated round about the *Pia Mater*, appears very thin, which is not, as in man or other perfect Creatures, marked with such frequent infoldings of the Vessels; but this most subtil *Meninx* being made of a texture of Fibres, only clothes, and every where intimately binds about the even and plain superficies of the brain contained within, and wholly destitute of turnings and windings about.

The fabrick of the brain in Fowls is otherwise than in man or four-footed beasts: for besides that in its compass the inequalities and the turnings and windings are wholly wanting; also more inwardly, the callous body and the *Fornix*, as also the chamfered bodies, which we described before, are all lacking: and besides, the substance of the Brain it self is figured after another manner. That these may the better be

be beheld, make the dissection of the Brain of a Goose or a Turkey-Cock ; and the Membranes being cut off, by pressing lightly the fissure or cleft of the Brain, you may divide the middle of it one from another, and go forward to separate it, till you come to its bosom, in which place are two marrowy bodies, which being stretched out like Nerves, connect the Hemispheres one to another. Either side of the *Interstitium* or the space between, is clothed with a whitish Membrane, which is marked with streaks or beams, lying or running from the whole compass or circumference, to the lower corner ; and these streaks concenter about the insertions of the medullary bodies. Then, if this Membrane be cut, in either Hemisphere of the Brain there will appear underneath a cavity, which goes under the whole space, from the side of the *Interstitium*, and for a great part, the hinder region of the Brain, and is arched or chambered with that streaked Membrane. Either cavity or hollowness, about the bottom, is opened into an intermediate or common passage, which lies open to the Tunnel ; and from either side of this passage the shanks of the oblong Marrow are stretched out, to which, on either side, the Hemisphere of the Brain is hung by two medullary bodies ; to wit, one marrowy or medullary body goes out from the mole or substance of the Brain lying under the Ventricle, the other from the streaked Membrane covering the Ventricle. From these two, placed on either side, the medullary bodies being stretched out cross-wise, like Nerves, join the two Hemispheres of the Brain to one another. Besides, these two growing together on either side, fix either Hemisphere of the brain to the shanks of the oblong marrow.

So the Figure of the Brain in Fowl, if you compare it with the Brain in men and of the more perfect four-footed Beasts, seems to be as it were inverted. For as in these the Cortical part is outward and the medullary laid under it ; so in Fowls, the lower frame of the Brain, which consists of a thick and closer substance, is instead of the *Cortex* or Shell ; but the outmost and upper Membrane, chambering the Ventricle, appears medullar or marrowy above any other part. Moreover, the Ventricles in the Brains of a Man and four-footed Beasts are beneath, and near the bottom ; in Fowls, above and nigh the outward border. The reason of this difference seems to be, because placed in a more perfect brain, such as is in Man and four-footed Beasts, the animal Spirits have both their birth and exercise ; viz. they are procreated in its Cortical or shelly part, and in its medullary, which being large enough, lyes under this, they are circulated and variously expanded for the acting of their faculties. But truly in the Brain of Fowls there is space enough for the generation of Spirit, but for their circulation there is scarce any left : to wit, the Brains of Birds seem not to be much possessed with the gifts of phantasie or memory : yea it is thought, that the Spirits begotten in the Brain are exercised chiefly in the oblong Marrow for the preserving the animal function ; for there, as we shall shew anon, the medullary substance, which is instead of the callous body, consists ; and like the streaked bodies in others, in these are streaked Membranes, through which the Spirits, procreated in the Brain are carried, without any order there, forthwith into the oblong Marrow : but because the Spirits, begot in the brain, ought to lay aside a serous excrement ; therefore the Ventricles from the complicature of the streaked Membrane upon the keel or lower part of the brain, and on the oblong Marrow it self, do serve conveniently enough for this business. Notwithstanding, because in the Brains of Fowls, the *Fornix* is wholly wanting, there are only two anterior Ventricles ; between which, the Choroeides infolding is stretched out ; the venous portion whereof, as was but now said, arises a little lower from the fourth bosom ; but the Arteries ascending, come from either side of the oblong marrow.

Nor is there a greater heterogeneity or difference of conformation in the Brain it self of Fowls, than in the oblong Marrow from the same in men and four-footed Beasts. For in the first Section, from whence the Optick Nerves arise, two noted protuberances grow to either side. These are much greater in proportion than the orbicular prominences in the more perfect Creatures ; so that they seem another additional Brain : either of them of a white colour, and purely marrowy, is hollow within ; so that in these kind of Animals are found two Bellies or Ventricles in the Brain, and as many in the oblong Marrow. And seeing in these, as in all other Animals, a cavity is put under the Cerebel, the Ventricles in the whole Head differ as well in number as in figure and position.

In the middle of the medullary Trunk, to wit, where those prominences grow to its sides, the Chink, leading to the Tunnel is cut, but into it the aperture of either Ventricle gapes or opens, that it is not to be doubted, but that the serotities heaped up there, are sent out by that way. Moreover it is likely, that these hollow and medullary prominences in Fowls supply the course of the callous body, to wit, in which the animal Spirits are circulated for the exercising their Faculties : because in the Brain the space is so narrow, that the Spirits cannot be produced and circulated together within its confines. Further, as in Fowls, the use of the animal Spirits is required for the act of the sensitive and loco-motive faculty, more than for phantasie or memory ; certainly the chief place where they may meet and be exercised, ought to be placed rather in the oblong Marrow than in the Brain.

The Carotidick Arteries, which carry the blood to the brains of the greater Birds, are so small, that there is no proportion of these to the same in man and four-footed beasts. Their Trunks being carried within the Skull, ascend without any branchings into net-like infoldings, after the same manner as in other Animals, nigh to the pituitary Glandula, and pass right into the brain, and distribute some small shoots of the Vessels both to its exterior compass, and through its inward recesses. But in truth, the brains of Birds are watered with a very small portion of blood, in respect of other living Creatures ; because, where the fancy or imagination is little exercised, there is not much blood required for the refreshing the animal Spirits.

Fowl (otherwise than some affirm) have both the mammillary processes, and the Cribrous or Sieve-like bone. For the anterior productions of the brain being highly extenuated and involved with the *Dura Mater*, stretching out almost to the middle part of the bill, are inserted into the triangular bone, which hath a double bosom, distinguished between with a thin mound or pale. But these processes being dilated within the bosom of the aforesaid bone, and in Bladders full of clear water, which are very like the mammillary processes in a Calf, full of clear water. Besides, as out of the fifth pair of Nerves a noted branch on either side passing through the ball of the Eye, enters into the cavern of the Nostril, a shoot of it being sent out of the Trunk, is bestowed to the very Orifice of the Nostrils; in the mean time, both the greater Trunks, compassing about the Cribrous bone, meet together, and presently going one from the other, and being carried to the end of the bill, are distributed into the palate. After this manner Fowls, even as men and four-footed beasts, are furnished with a peculiar organ of smelling, to wit, with a double mammillary process; and besides, they have within the Nostrils additional Nerves out of the fifth pair, by whose action and communication of branches into other parts, and among themselves, so strict an affinity is contracted between the smell and the taste. The other pairs of Nerves are almost after the same manner as in men and four-footed beasts. In like manner we also observe, that there is no great difference as to the Cerebel and the other portion of the oblong marrow; between Birds and the other Animals we have already considered on, unless that the orbicular prominences before the Cerebel, and the other annular under it, meeting within them, are both wanting in Fowls; indeed these latter seem not at all to be required; but instead of the former, they are easily supplied from the hollow medullary prominences, such as we have shewn to be in Fowls.

And these are what are chiefly worth noting to be found in the brains of Fowls. We have already mentioned, that there is a certain likeness between these and Fishes as to the most parts of the head; wherefore it will seem to be to the purpose, that here for a conclusion we should say something of the brain of Fishes. First, we shall observe, that as the heads of Fishes, in respect of the whole body, are greater than of any other living Creatures, yet they contain in them less brain than others. For two little moles or substances, placed before, sustain the whole place of the brain, properly so called; out of these, two signal smelling Nerves proceed, which are carried by a long and straight journey to the holes made hollow, out of either side of the mouth, and which are instead of nostrils: and this is singular to Fishes. Moreover, we advertise concerning the Optick Nerves, that they, as in other living Creatures, inclining mutually one to the other, are not however united, unless perhaps towards the superficies; but they are crossed, and a Nerve arising from the right side of the oblong marrow, is carried into the left Eye, and so on the contrary: so indeed, that the visory rays have their refraction, not only in the Eye, but within the very bodies of the Nerves. The oblong marrow in Fishes, wholly after the like manner as in Birds, hath two signal protuberances hollowed within; and in truth, as to local motions, the Spirits in either seem to be exercised after the like mode. For as Fishes swim in the water, so the flying of Fowls or Birds seems a certain kind of swimming in the Air. Further, in these 'tis observable, there are the pituitary Kernel, the Tunnel, and the Carotidick Arteries as in other Animals; also many pairs of the Nerves have the same origines and distributions, excepting that the hearing Nerves are here wanting; although *Cassernus Placentinus* attributes this gift to the smelling Nerves. The figure of the Cerebel is the same as in more perfect Animals. Besides, what we have remarked concerning the wandering pair of Nerves in man and four-footed beasts; to wit, many fibres of it arising together, the trunk of the Nerve from the spinal marrow comes to them: in like manner the same is in Fishes. But to describe them all further is needless; for the rest, as those which are proper to them only and Birds, as also those which they have common with Fowls and the more perfect Animals, may be easily known, partly out of the peculiar similitude with birds, and partly out of the universal Analogy of all. Therefore we will now philosophise upon the Use and Action of the Brain and its Parts, and of its Appendix, together with the whole oeconomy of the animal Function: where in the first place, we will inquire into the offices of a more perfect Brain, such as of man and four-footed beasts; and also secondarily and collaterally we shall explain the Offices and Actions of a less perfect Brain, and of its Parts, such as that of Fowls and Fishes.

C H A P. VI.

Of the Offices of the Brain and its Parts : where first of all the Uses of the Skull and the hard Meninx or Dura Mater is treated of.

THE Poets feigned *Pallas* to be formed within the Brain of *Jupiter*, and from thence to be born. In truth, within the Womb of the Brain all the Conceptions, Ideas, Forces, and Powers whatsoever both of the Rational and Sensitive Soul are framed ; and having there gotten a species and form, are produced into act. Wherefore it will be worth our labour to inquire into these places, of the generation of these more noble faculties, and the first rise and primitive beginnings of them, as also more curiously to consider the divers parts of the Brain, or the Organs serving to their Generation : And I go about this part of my labour the more willingly, that I may by handling the thread of our dissection again, bring all the Phenomena, before given to our inspection and sense, before the Eye of Reason, and to be again weighed by a more severe Examination of Discourse ; at least those things which seem to be of the greater moment, and chiefly worth taking notice of. Neither do we think here to heap up into a great Volume the several things worn out by the handling of others, and offered to common observation.

Therefore recollecting the Anatomy of the Brain, the first things to be considered are its coverings, to wit, the Skull, and the two Meninxes or Maters. Concerning the first it is observed, that all perfect Animals have an hard and bony Skull. A double reason for which may be given : First, that the Head being destined for the most noble use, might be protected with a more firm and not easily penetrable covering, as a natural Helmet, against the injuries of external strokes ; besides secondly, as this is in the place of Armor, so also of a Cloister ; because the same covering the *dura Mater* within, may restrain and keep within the Brain the Effluvia's of the animal Spirits, lest they should too thickly evaporate, or in heaps. Further, as the Skull for these ends is made bony, the efficient cause are the saline Particles of the blood watering the brain, which being unprofitable to the interior work of the animal Spirits, and so to be sent away outwardly, grow together thus in the circumference, and are congealed into a stony hardness : For indeed the blood being carried towards the Head, as it abounds very much in Spirit, so in Salt ; its Particles highly volatile, being joyned to the Spirits, are bestowed on the brain ; in the mean time, the saline little bodies, which are of a more fixed nature, being thrust out into the circumference, from the Spirit implanted in the Brain, constitute the stony Skull, as it were a bubble covering inclosed wind.

Within the hollow superficies of the Skull, there appear many furrows and inequalities imprinted by the protuberances of the Vessels ; and we perceive frequently either border or plate of it to be perforated by the passing through of the Vessels in several places : but the Arteries, arising in the exterior superficies of the *dura Mater*, make these kind of little ditches through the concavity of the Skull. For when the whole substance of the brain is at first soft, and easily giving place, like Wax ; the Arteries underneath it continually beating, as it hardens by degrees, easily imprint the marks of their tracks.

The figure of the Skull in four-footed beasts is narrow and preft down, but in man, the substance of whose brain is large, there is required a more capacious and almost spherical figure. For as God gave him an upright countenance to behold the Heavens, and also endued his brain with an immortal Soul, and fitted for the speculation of Heaven ; therefore his face is erect or lifted up ; so the brain it self is placed in a more eminent place, to wit, above the Cerebel and all the Sensories. But in Brutes, and such whose faces are prone towards the Earth, and have a brain unfit for speculation, the Cerebel, however serving to the more noted action and office of the Præcordia, is placed in the highest seat to which the mole of the brain is subjected. Besides, some organs of the Senses, to wit, the Ears and Eyes, if they be not superior, they are placed at least equal to the brain. In an humane Head, the Basis of the Brain and Cerebel being placed nigh together, yea of the whole Skull, is made parallel to the Horizon ; whereby it comes to pass, that there is less danger for any portion of the head to be jogged here and there, or to be moved out of its proper seat ; But in four-footed beasts, who go with an hanging down head, the Basis of the Skull makes a right angle with the Horizon ; wherefore the brain being subjected, the Cerebel is put in the highest place ; so indeed, that this seems less stable, and that it may shake, or be moved from its seat. However against this inconvenience, lest a frequent concussion of the Cerebel might induce a sinking down or loss of the Spirits, or irregularities about the Præcordia, in some it is taken care of by a wonderful artifice of Nature ; for as in all the frame or substance of the Cerebel is most strictly bound fast together by the *Dura Mater*, besides in some it is staid by a bony fence ; but in others, as in a Hare, Rabbit, and other lesser Brutes, a certain portion of the Cerebel is included on either side by a stony bone, and so by this double hold its whole bulk or substance is firmly tyed to the Skull. Concerning the chief bones of the Skull, viz. the Cuniform or Wedge-like bone, the Cribrous or Sieve-like bone, and the auditory or hearing Organ, they shall be spoken of in their proper places, when we come to treat particularly of the Ventricles

Ventricles of the Brain, and of the Senses to which these bones serve. We shall pass next to the hard *Meninx* or *dura Mater*.

The *dura Mater* or hard *Meninx*, formed of a double kind of Vessels and Processes, bears also a double Aspect, and owes part of its office to the Skull, that is about it, and part to the *Encephalon* contained within it. The exterior processes of this Membrane are insinuated within all the bosoms and cavities of the Skull; to some whereof they are a covering and defence, but to others they impart a sensible force, which manifestly appears in the Sieve-like bone, through whose holes the fringes of this Membrane passing, conduce something to the sense of smelling. Also the productions of this, lying over the recesses and caverns of the Wedge-like bone, fortifie the ways for the entrance and coming out of the Vessels. The interior processes of the *dura Mater*, which belong to the Head, divide and distinguish between the parts of the Brain and Cerebel; and in those places the *dura Mater* is very thick, lest in any great concussion of the Head, these two should be smitten one against another, and should press one upon the other. Wherefore in Dogs (as we have already hinted) who are wont to run violently with their heads down, there is sent down between these bodies a bony fence. In like manner in a Cat, Horse, Fox, and many other Animals, from whose manner of living and use it is required, that they be moved with a swift motion, that bony fence, commonly called the Triangular Bone, is sent down deeply between the Brain and the Cerebel; yea, and all the bosoms pass through that bone in the holes curiously made hollow in it.

The Vessels belonging to the *dura Mater* are either Arteries, that carry the blood thither; or they are Veins, which receiving from thence the superfluous blood, and from the whole Head besides, return it towards the Heart. As to the first sort of Vessels, on either side, two Arteries arising from the Carotidick Artery on the same side, before it comes to the Basis of the Brain, are carried into the *dura Mater*: which notwithstanding, only possessing the exterior superficies or convex part, carry blood and juyce to this Membrane, also in some measure to the Skull and its coverings. As to the Vessels carrying the blood back, this *Meninx* contains four, into which, as into a great Sea, all the Rivulets of the Arteries, serving the whole Head, do exonerate themselves: to wit, there are observed in this Membrane four noted Cavities, commonly called Bosoms; which are disposed after that manner, that, like Promptuaries or Store-houses framed in several places, they receive the blood returning from every region and corner of the brain: For the third bosom, or the longitudinal, looks towards the anterior brain, the fourth towards its middle; but the first and second admit the blood flowing back from the Cerebel and hinder part of the brain. Further, out of these the third and fourth disburden themselves into the first and second; and these at length transfer their burden into the Jugular Veins. On every side, from these bosoms, the lesser Vessels, viz. the chanel of the Veins are sent forth, which going out nigh the interior or concave superficies of the *dura Mater*, are presently inserted into the *Pia Mater*, and following its protension, being distributed through the whole compass, and all the interior recesses of the brain and its Appendix within the Skull, and being complicated with the Arteries, receive the superfluous blood, and carry it into those greater cavities. That it is so, it plainly appears, because if you squirt a liquor, dyed with Ink, into the Pipe of the Artery, that passing through the arterious shoots, and then the veinous, goes through at last into the bosoms.

Whilst the blood, returning from the whole interior Head, is collected within those bosoms, as with a full belly, it seems also in another respect to be of a very notable use; to wit, for the supplying of heat, requisite for the distilling forth of the animal Spirits, as if it were a certain Chymical operation. For as much as the blood to be distilled, is contained in the Vessels, interwoven into the *Pia Mater*, the superior Rivers diffused on every side through the *dura Mater*, the heat being brought to it like a *Balneum Marie*, flow about the under-lying blood, and so force out of it a most subtil Liquor into the substance of the Brain; or rather, the blood raising up heat within the bosoms, is like the fire of suppression, which in the distillation by descent, is inkindled round about the Vessel containing the matter to be distilled. For indeed the interior substance of the Brain, for that it is endued with plenty of Salt and very little Sulphur, is of a more frigid temper: wherefore, that from the blood watering its superficies, the spirituous part may be stilled forth, and forced into its middle or marrow, the degree of the ambient heat ought to be made the more strong, such indeed, as the blood collected in the ample Estuaries of the bosoms, may easily afford. Further, as those bosoms being distended with heated blood, are like a certain distillatory Bath; so the other Membrane of the *dura Mater* being stretched out about the whole Head, is like an impervious Alembick, which with its covering keeps within the spirituous breaths, that they may not be immoderately evaporated.

Concerning this Membrane there may yet be considered, with what motion or sense it is endued. And as to sense, 'tis not to be doubted, but that it hath it exquisitely: For since all the Membranes have feeling, and owe that faculty to the afflux of the animal Spirits from the Brain, surely this *Meninx*, for that it is nearer and very much of kin to the Brain and its Appendix, so that it clothes very many Nerves going out of the Skull, it obtains a very accurate virtue of feeling: which thing also may be argued from the effect; because the pains of the Head often proceed from the breach of unity excited in this Membrane. But that it hath motion, it can hardly be thought, because it is tyed in very many places to the Skull; and yet it is probable, that the same may sometimes, in some parts at least, be contracted and wrinkled or drawn together: And certainly there is no doubt, that it is contracted and remitted in sneezing.

In like manner, when from an hurt of this a Vomiting or Convulsive motions follow in the *Viscera* of Members, this Membrane is the cause, which being somewhere contracted or divided, infolds with it self the substance contained within the same Convulsion or Spasm.

Concerning the motion of this Membrane, a curious mind may yet further consider its texture, and especially how it is within the cavities of the bosoms, and the *Interstitium* or separation of the Brain and Cerebel. For in these places are found many Fibres, or as it were greater or nervous cords or strings, such as we have observed to be variously stretched out in the Ventricles of the Heart. Within the bosoms, from the various processes of the Membrane, a cavity full of turnings and windings, and manifestly divided, as it were with many little Cells, is constituted. This seems to be thus made, to this end, to wit, that the blood returning back from divers little rivers into the cavities of the bosoms, may be retarded by several obstacles, as it were little flood-gates; lest perhaps rushing too impetuously and by heaps, it might flow within this Sea with a vertiginous and inordinate motion. But there is observed, besides these intrications and little cells of this Meninx in the heads of four-footed beasts, that moreover in the whole cavity of the bosoms, very many cords, as it were Ligaments, are every where produced from one side to the other. The office of these is partly, that they may contain the sides of the cavity within their due ends of aperture and dilation, lest they should be distended above measure by the vehement rushing in of the blood, and so may presuppose the substance of the brain. Yea the contexture of these whitish Fibres, which are met with, both within the cavities of the bosoms, and in this Meninx, going about the Cerebel, and distinguishing between it and the Brain, seems to intimate, that they serve also to some motion. For it may be suspected, that those strong Fibres, and as it were Ligaments, do sometimes contract, sometimes dilate, and variously draw the Membrane to which they are knit. From these kind of motions of the *dura Mater*, the blood flowing within the bosoms, may be variously agitated, and as occasion serves, sometimes hastened in its Circle, and sometimes restrained or hindered; for in many affections of the sensitive Soul, the blood being disturbed from its equal circulation, is sometimes precipitated by heaps and impetuously to the Heart, and sometimes detained from its nest longer, nigh the confines of the Brain. But that various whirl-winds of passions stir up such irregularities in the motion of the blood, the nervous parts implanted about the *Præcordia*, are in some measure the cause, which by contracting or dilating the same, variously moderate the course of the blood, yet so, that in the mean time, some part of this office is due from the brain it self, or at least to its Appendix. Indeed the brain it self wants motion; but the blood passing through its substance, for as much as it is poured wholly in this Meninx, and passes through its receptacles, is at the motion and beck of this Membrane, sometimes driven away from the brain, and commanded to succour the Heart, as in fear and great sadness, sometimes being hastened towards the brain, is for some time prohibited from flowing back, as in shame, indignation, and some other affections.

Truly, that these kind of interior processes of the bosoms, and as it were transverse strings or cords, do conduce to the more commodious reduction of the blood, we gather also from hence, that in working beasts, whose brain (because they feed and go with a prone and hanging down head) is in greater danger of an inundation of the blood, those processes are very big, for that they being successively contracted, may leisurely thrust out the blood, apt otherwise to stagnate by reason of the inclination of the head. Neither is it from the purpose to observe here, that these same Animals are always furnished, for that reason, with a greater wonderful Net: by which means indeed it is provided, that the blood may not too much invade the brain by heaps; as care is taken by the artifice but now described, lest the same should make too long stay in the brain, and so oppress its more weak frame.

Therefore in the last place, that I may recollect what I have said of the *dura Mater*, and rehearse its chief uses: First, It covers over the Skull within, and reaches to it somewhat of nourishment by the Vessels. Secondly, It is a covering to the whole head, and serves to distinguish its chief parts. Thirdly, It contains the Vessels designed for the reducing the blood from the whole interior head; which, in the mean time, by reason of the plenty of the blood contained in them, and the opportunity of their situation, administer requisite heat for the distillation of the Spirits. Fourthly, It provides ways for the admission and going out of all the Vessels within the Skull, and fortifies them; to which may be added, that it bestows on some of them their Coats; as shall be shewn anon. Fifthly and lastly, This Meninx being here and there contracted or divided by the animal Spirits variously moved, according to the passions of the Soul, or the necessities of Nature, stays the blood sometimes longer near the confines of the Brain, sometimes drives it forward from thence towards the *Præcordia*.

C H A P. VII.

Of the thinner Meninx or Pia Mater, of its stretching out, as also of the Infoldings of the Vessels every where interwoven with it.

THE interior *Meninx* or *Pia Mater* is far thinner than the exterior, and consists of a most subtle contexture of Fibres. This does not compass about the *Encephalon's* superficies as loosely as the *Dura Mater*; but embraces it so very strictly, that it is very hardly separated from it: besides, it insinuates itself into all its turnings and windings and furrows, and clothes their inward parts. Further, this *Meninx*, although it be thin, yet being covered over throughout with the infoldings of Arteries and Veins, is interwoven with them, and so waters all the spaces of the Brain and Cerebel with innumerable rivers. For as the Region of either of these, especially of the Brain, is full of turnings and windings, this Membrane in like manner grows to the deep furrows of the cranking turnings about, and also to the tops of the ridges; yea, the chief complications of the Vessels are still placed in the vallies, as if they were there hid in regard of their safety. Neither doth this *Meninx* only cover the gapings of the turnings and windings about; but also gathers together the tops or heights of all their interfices or places between, and knits them together, and so makes the whole superficies of the Head plain, globous, and as it were like the World.

That the diffusion of this wonderful Membrane into all the turnings and windings of the Brain, and the distribution of the Vessels through those most intimate recesses, may be the better beheld; let the head of a man, or of a brute beast that dyed of the Dropsie, be opened: For in such, whose brain abounds with much moisture, the little stays, whereby this *Meninx* is fixed to the substance of the brain, are loosened, so that the Membrane, with the infoldings of the Vessels, may be easily drawn away, and pulled off almost whole: which indeed being pulled off, the folds of the brain will appear naked: also the insertions of the Vessels every where into the more inward substance of the brain, may be perceived. But to a sound and dry brain the *Pia Mater* sticks so closely, that it can scarce be drawn away in any part, or separated with a Penknife.

We have already shewn after what manner the Veins and Arteries (which creeping like Ivy, are knit into the *Pia Mater*, and variously interwoven into it) cover over with most thick little shoots, the whole compass of the Brain and Cerebel, and their Interfices, the gapings of the cranking turnings and windings about, bosoms and cavities, and send forth every where small shoots into the medullary substance; so that it is not to be doubted, but that the animal Spirits, being as it were stilled forth immediately from the blood, every where in the whole head, are received into the Pores and passages of the Brain and Cerebel. From whence it will be easie to assign the use or office of the *Pia Mater*, viz. First, this Membrane clothes the universal parts of the whole *Encephalon*, and distinguishes them all one from another. For indeed, this lying over all the gapings and interfices of the turnings and windings, is instead of a mound or fence, by which the animal Spirits are restrained every where within their proper cells and orbs of expansion, nor are they permitted by this means to run beyond their bounds, and so confound the acts of the many Faculties. Then secondly, this *Meninx* sustains all the blood carrying Vessels, viz. both the Arteries and Veins, together with their manifold productions, and so affords a passage to the blood, by carrying it to and fro towards the brain.

Concerning these Vessels, which are knit to this *Meninx*, and follow its stretching out into all parts, there are many admirable things to be met with, and highly worthy of note, the uses and reasons of which is our purpose to search into.

As to these, we shall first observe, that these Arteries and Veins, otherwise than in any other part of the body besides, not arising nigh one another, go forth as companions, but going forth from opposite ends, meet every where mutually, viz. the Arteries ascend from the Basis of the Skull, and by creeping through the whole, emit upwards shoots and branches, which are met by the Pipes of the Veins arising out of the bosoms, and carried downwards. By this means the rivers of the blood seem to be made equal every where in the Brain, viz. whilst the smaller shoots of the Veins follow or match the greater branches of the Arteries, and on the contrary, the small branches of the Arteries the Trunks of the Veins.

Secondly, We have already shewn, that these Vessels are variously and very much ingrafted or inoculated among themselves, not only the Arteries with the Veins, but what is more rare and singular, Arteries with Arteries; to wit, the Carotidick Arteries of one side, in many places, are united with the Carotides of the other side; besides the Vertebrales of either side among themselves, and are also inoculated into the posterior branches of the Carotides before united. The joinings together of the Carotides, in most living Creatures, are made about the Basis of the Skull under the *Dura Mater*, and that after a diverse manner, in some communicated through the Vessels of the Wonderful Net from one side to the other; in others (as in a Horse we have observed with a certain admiration) the arterious chanel is produced

produced between the Trunks of the *Carotides*, whereby the blood may be carried from one side to the other, and so on the contrary. But besides, between the *Dura Mater*, about the Basis of the Head, the same kind of ingraftings of the Arteries are still seen in man and all perfect four-footed beaſts.

The reason of these seems to be partly, that the blood to be carried from the Heart into divers Regions of the Brain, might be exactly mingled as to its parts and particles, before it come to the place designed. For the Torrent of the blood, because divided into lesser rivulets, is incident to languish in so long a circuit, and its Spirits to be depauperated, and lastly it self to grow cool; unless that various courses of its *Latex* should anew inkindle this vital flame about to be extinguished or dye.

But there is another reason far greater than this of these manifold ingraftings of the Vessels, to wit, that there may be a manifold way, and that more certain, for the blood about to go into divers Regions of the Brain, laid open for each; so that if by chance one or two should be stoppt, there might easily be found another passage instead of them: as for example, if the *Carotides* of one side should be obstructed, then the Vessels of the other side might provide for either Province. Also as to the *Vertebral* Arteries, there is the same manner of provision made. Further, if both the *Carotides* should be stoppt, the offices of each might be supplied through the *Vertebrals*, and so on the other side the *Carotides* may supply the defects of the shut up *Vertebrals*.

After this manner, lest there should be wanting an afflux of the blood at any time in any part of the Brain, or its Appendix, within the Skull, there is care taken with singular Art: For as there are four distinct passages, and those remote one from the other, of this *Latex*, if perchance three of them should happen to be shut up, the blood being carried through one only, will soon supply or fill the chanel and passages of all the rest. Which thing I have found by experience often tryed, not without admiration and great pleasure. To wit, I have squirted oftentimes into either Artery of the *Carotides*, a liquor dyed with Ink, and presently the branches on either side, yea and the chief shoots of the *Vertebrals*, have been dyed with the same tincture: yea, if such an injection be sometimes iterated by one only passage, the Vessels creeping into every corner and secret place of the Brain and Cerebel, will be imbued with the same colour. Also in those who have the wonderful Net, the Tincture or dyed Liquor being injected in one side, it will come through the Net like infoldings of the Vessels in both sides. Hence it plainly appears that there is a communication between the Vessels watering the whole Head; and although every Artery is carried to one only Region, as its peculiar Province, and provides for it apart; yet, lest any part should be deprived of the influence of the blood, more ways lye open to every part by the ingraftings of those vessels; so that if the proper vessels by chance should be wanting in their office, its defect may presently be compensated by others neighbouring.

It is not long since we dissected the dead body of a certain man, whom a great *Scirrhus* or hard Swelling within the *Mesentery*, growing at last ulcerous, had killed. When his Skull was opened, we beheld those things belonging to the Head, and found the right *Carotides*, rising within the Skull, plainly bony or rather stony, its cavity being almost wholly shut up; so that the influx of the blood being denied to this passage, it seemed wonderful, wherefore this sick person had not dyed before of an *Apoplexy*: which indeed he was so far from, that he enjoyed to the last moment of his life, the free exercise of his mind and animal function. For indeed, Nature had substituted a sufficient Remedy against that danger of an *Apoplexy*, to wit, the *Vertebral* Artery of the same side, in which the *Carotidick* was wanting, the bulk of the Pipe being enlarged, became thrice as big as both its Pipes on the other side: because, the blood being excluded the *Carotidick*, adding it self to the wonted provision of the *Vertebral* Artery, and flowing with a double flood into the same belly, had so dilated the chanel of that Artery above measure. This Gentleman, about the beginning of his sickness, was tormented with a cruel pain of the Head towards the left side. The cause whereof cannot be more probably assigned, than that the blood excluded from the right *Carotidick* Artery, when at first it rushed more impetuously in the left, had distended the Membrane; and therefore the same distemper did afterwards vanish of its own accord, to wit, the superfluous blood being derived through the *Vertebral* Artery.

Thirdly, Concerning these sanguiferous Vessels covering the *Pia Mater*, we observe, that the Arteries and Veins, whilst they meet one another, going out from opposite ends, do not only transfer their burden immediately through the several branches or shoots, mutually ingrafted, as is wont to be done in other parts of the Body; but being variously complicated and interwoven, do constitute every where admirable infoldings, into which, for the most part, very small and very numerous Glandula's or Kernels are inserted. Which thing is seen, not only in the infoldings, which are called *Choroideas*, (by which name, besides those which are found within the plicature or folding up of the Brain, we also intend others planted together behind the Cerebel) but these kind of infoldings of the Vessels, with Glandula's sowed between, are seen every where to be sprinkled through the whole compass and interior recesses of the Brain and Cerebel, and especially between the gapings of their turnings and windings and interstices. This is clearly manifest in a moiſter Brain, or in an Hydropical, where the very small Glandula's; which otherwise are scarce to be seen, being intumined by the moisture, are easily beheld. Moreover, from the aforesaid infoldings, on every side implanted, little slender Vessels, being every where sent forth, enter the Cortical, and in some measure the medullary substance of the Brain and its Appendix, for if you squirt into the *Carotides* a black liquor, besides the shoots of the Vessels, which it dyes every where with the same colour, little blackish pricks will appear sprinkled in the substance of the Brain. Further, if the Brain

Brain of a living Animal be cut up, the live blood will spring forth both from its *Cortex* and medullary part. The reason and end of all which, if they be inquired into, it seems that these foldings of the Vessels, being variously complicated with repeated windings about, as if they were little serpentine channels hanging to an Alembick, through whose narrow straits the blood passing with a long circuit, becomes still more subtil and elaborated: to wit, its thicker part, being by degrees put off in its passage, or sent away by the little branches of the Veins, and so at length the only pure and most spirituous blood, and it self now ready to go into animal Spirits, is admitted within the Pores and passages of the Brain. But as the blood or sanguinolent part is sucked up by the Veins, so it's very likely the Serum or watry part is received by the Glandula's or Kernels interwoven in them. For it appears not for what other end these Arteries are every where beset with so many Kernels, unless they should lay up in them the superfluous serosities. Between these infoldings there appear not any Nerve to be found, which may require any juyce or serous humor from these Kernels; and 'tis not yet found, whether these Lymphæducts or Water-carriers be accompanied with any Vessel: wherefore it may be lawful to suppose, that whilst the pure and spirituous part of the blood, being separated from the rest of its mass, is stilled forth into the brain, the serous humidities are received by the Glandula's, which are numerous, and that they are for some time retained by them, till they may be sent away into the Veins growing empty again.

Thus far we have beheld only the superior branchings forth of the blood-carrying Vessels, which are every where interwoven in the *Pia Mater*; and their infoldings, which like the leaves of a Wood, or creeping Ivy, cover the exterior compass of the whole Head. But by what means, and as it were Chymical Artifice, these Vessels do instil the animal Spirits into the Brain and Cerebel, and serve for the use of one another besides, shall be told anon, after we have considered of the inferior Aspect and next the ground of this most thick Wood, viz. the greater Trunks of all the Arteries, which are destinated for the Brain, where they pass through the Skull, and shew themselves beyond it.

CHAP. VIII.

Shews with what difference the Arteries in various Animals pass through the Skull; also for what use the wonderful Net is made, and the reason of it.

THE Arteries destinated to the Brain, are four in number, viz. two *Carotides*, and as many *Vertebrials*. Concerning the former, we have already observed, that their Trunks pass through the Wedge-like Bone, as it were with a mechanical provision; to wit, either Artery is so bowed and intorted in its ascent, that the blood, before it can reach to the Brain by a repeated stopping of shores, or hindered by a certain let or impediment, might flow to it less rapidly and more slowly. But this is not effected after one and the same manner in all Animals: for although the ascent of the Artery be oblique and intorted in all, yet in some, viz. in a Man and a Horse, it being bowed about with a greater compass, till enters, even to the Brain, with a single and undivided Trunk: when in most other beasts the same passes the Skull with a lesser circuit, and sliding presently under the *Dura Mater*, diversifies it self there into Retiform infoldings, commonly called the wonderful Net. Therefore it seems to be to the purpose, that we inquire into the various reasons of this difference.

In the first place therefore we shall advertise you, that the Carotidick Artery in a man enters a little more backward the Skull, than in any other Animal, viz. nigh that hole through which the lateral bosome slides out of the Skull about to be implanted into the Jugular Vein; for in the rest, this Artery arises within the Skull under the end or acute process of the stony bone. But in an humane Head, the same being carried about by a longer compass, (that the Torrent of the blood, before it comes to the border of the brain, might flow slowly and pleasantly with a broken force) attains to the basis of the Skull nigh the den made by the ingress of the lateral bosome; where being presently intorted, it enters the proper Chancel insculped in the Wedge-like bone, and for the greater assurance it is clothed besides with a thicker additional Coat. This double defence seems to be given it, lest the blood, boiling up too much, and whilst it is carried violently towards the head, should make a Whirlpool about the ingress of the Skull, to wit, where it begins to be wreathed about from its direct ascent, and should break by its flood the banks of the Belly, unless they were more firm. The Artery being slid out of the bony channel, lays aside also its asciticulous or additional Coat; and now being well enough defended within the Skull, goes forward clothed only with its proper Coat, and creeps under the *dura Mater*, and being as it were depressed in the midst of its passage into a valley, being immediately carried out again, it goes on till it comes to the head of the Turkey Chair, where again being bent in and intorted, with a certain compass, it ascends straight, and boring through the *dura Mater*, is carried towards the brain. The Trunk of this *Carotis*, like a Meander, passing through the Skull with a very much bending way or passage, is aptly represented in the first Figure of the following Table.

If the reason of this kind of Conformation be inquired into, it easily occurs, that in an humane Head, where the generous Affections, and the great forces and ardors of the Souls are stirred up, the approach of the blood to the confines of the Brain, ought to be free and expeditious; and it is behoveful for its River not to run in narrow and manifoldly divided Rivulets, which would scarce drive a Mill, but always with a broad and open chanel, such as might bear a Ship under Sail. And indeed, in this respect, a man differs from most brute beasts, in which, the Artery being divided into a Thousand little shoots, lest it should carry the blood with a fuller chanel, or more quick course than is requisite, makes the Net-like infoldings, by which indeed it comes to pass, that the blood slides into the Brain very slowly, and with a gentle and almost even stream. If that be true, as some affirm, that the wonderful Net also is sometimes found in an humane Brain, I believe it is only in those sort of men, who being of a slender wit or unmoved disposition, and destitute of all force and ardor of the mind, are little better than dull working beasts in fortitude and wisdom.

Secondly, The conformation of the Carotidick Artery in a Horse, comes nearest its structure in a man for in this the Artery enters the Skull also lower, and with a greater compass than in other four-footed beasts: which being passed, its Trunk being intorted, with a certain compass, and then a little depressed, goes forward whole to the side of the Turkey Chair still with a full and broad chanel: which truly ought to be made so, because magnanimous and fierce forces are convenient for this Animal, born as it were for War and any dangerous attempts; and so there was need, that the blood might ascend the Brain with a free and plentiful course, and (when occasion requires) with a full Torrent. But though the blood passes through the Basis of a Horses Skull in the same undivided chanel, yet it ought not to come to the Brain itself in one single passage; because the frame or substance of this in a Horse being far weaker and colder than in a man, it might be overthrown and drowned by the blood rushing in by heaps: wherefore the great River of the Artery disburdens it self by two Emissaries, and pours out its *Latex* at so many distinct places of the Brain. Further, as if by this means there were not yet sufficient caution against the Deluge of the Brain, a transverse or cross chanel, as it were a diversion, is formed between the chanel of either Artery; through which the blood, being straitned for room, may go aside, and flow and re-flow from one bank or chanel to another, rather than oppress or overflow the Brain. Also besides, certain shoots being sent out from the Trunk of either Artery, are inserted into the pituitary Glandula, the use of which is doubtless to separate certain serosities of the too watry blood, and to lay them up into that Glandula, whereby the rest of the bloody *Latex*, to be carried to the Brain, becomes more pure and free from dregs. By what means the Carotidick Arteries, in the head of a Horse, pass through the Basis of the Skull, is represented in the second Figure of the following Table. I have not yet had the means to inspect the brains of a Lyon or a Monkey; but there is reason to suspect, that in these also the Carotides do pass through the Skull with a single Trunk. In a Sheep, Calf, Hog, yea in a Dog, Fox, Cat, and other four-footed beasts, which I have hitherto opened, this Artery is devaricated into Net-like infoldings, which Vessels, for what causes and for what uses they are so made, we shall now inquire into.

Thirdly therefore, most other four-footed beasts, different from a Man and a Horse, have the wonderful Net adjoyned to the Carotidick Artery. In truth, this is met within so many, that common Anatomy hath ascribed it to all Animals, and also to man it self. In whom it is found, we observe, that the Artery, about to enter the Skull, is not carried about with so long a compass, but rising up nigh the hinder part of the Turkish Chair, is presently divided into small shoots; yet so, as one little chanel is stretched right out, which the blood quietly running to, passes through without any stay, being carried straight into the Brain: but from the side of this many rivulets are derived on every side, into which the blood impetuously ascending, may be easily diverted. These little rivers are partly ingrafted into the veinous passages of the same, and the Vessels of the other side, and are partly carried into the pituitary Glandula, and partly a compass being fetched, are returned into the former chanel or belly of the Artery. That it is so, besides naked inspection, appears plainly by this Experiment. If below the Skull, an inky liquor be gently and by degrees injected into the Trunk of the *Carotis*, that passing through the straight passage, is carried presently into the Brain, nor does it dye the lateral infolded Vessels with its tincture; but if this liquor be immitted continually and forcibly, presently running into the folds, it will make black the Vessels of the same and of the opposite side, also entering the hither part of the Glandula and its interior substance. If the use of these kind of infoldings of the Vessels, or the wonderful Net be inquired into, I say, that it is made chiefly for these ends: *viz.* First, that the Torrent of the blood being divided into small rivulets, its more rapid course may be so far dull'd or broken, that it may be but leisurely instilled into the Brain. For otherwise in labouring beasts, who go with their hands hanging down, and have but a weak brain, the more free influx of the blood might easily overthrow the fabrick of the Brain, and spoil the animal Spirits. Secondly, the divarication of the *Carotides* into Net-like infoldings, hath another use of no less moment, to wit, that the more watry blood being (as it is its temperament in most Beasts, and especially in those who are fed with herbage) before it be poured upon the Brain, might carry away some part of the superfluous Serum to the pituitary Glandula, and instil the other part into the branches or shoots of the Veins to be returned towards the Heart. Thirdly and lastly, for as much as the Vessels on either side are mutually inoculated by this means, there is care taken both that the blood may be exactly mixed before it ascends to the Brain, as also that more certain ways may be made for its passage: because, if perchance an obstruction should happen in one side of the wonderful Net, the blood by that infolding being presently

presently carried to the other, may find a passage: for this cause, to wit, that the blood might be the better prevented from any impediment in its passage, the Vessels are not only inoculated under the *Dura Mater* about the wonderful Net, but the Arteries again on either side, do the same thing as soon as they being knit to the *Pia Mater*, reach the superficies of the Brain, as hath been already shewn. By these sort of ingraftings of the Vessels in the wonderful Net, it comes to pass, that an inky liquor being injected into one of the *Carotides*, and forced upwards, descends by the Trunk of the Artery on the opposite side, as we have elsewhere observed. Some rude draught of the wonderful Net is expressed in the third Figure of the following Table.

The First Figure

Shews the ascent of the Carotidick Artery, and its situation within an humane Skull, before it is carried towards the Brain.

- A. The Trunk of the Artery ascending towards the Skull.
- BB. The same, whilst it is included in the bony Chancel, being clothed with an additional Coat.
- C. The incurvature or bending of the Artery, reaching within the bosom of the Skull representing the bending of a double S.
- D. The Trunk of the same being carried towards the Brain.

The Second Figure

Shews the ascent of the Carotidick Arteries, and their situation in a Horses Skull.

- AA. Either Carotidick Artery ascending towards the Skull.
- BB. The Trunk of either, having past the Skull, pressed down as it were into a vally.
- CC. The communications of either by cross Branches.
- DD. A Branch from either Trunk destinated for the *Dura Mater*.
- dddd. Little shoots on either side sent into the pituitary Glandula or Kernel.
- EE. FF. Either Carotidick Artery being divided before it reaches the Brain, and ascending with a double Trunk.

The Third Figure

Shews the wonderful Net with the pituitary Kernel in a Calfs Skull.

- A. a. The direct Chancel of the Artery.
- B. The Net-like Infoldings of the Vessels stretched out by that Chancel towards the pituitary Kernel.
- C. The pituitary Glandula or Kernel.

The Fourth Figure

Shews after what manner the lateral Bosom goes into the Jugular Vein with a diverting place hanging to it.

- A. The lateral Bosom descending.
- B. That Bosom sliding into the Skull, and dilating it self into a large and round Cavity, for the receiving of which there is a peculiar Den formed in the outward part of the Skull.
- C. The aforesaid Cavity or diverting place, in which the blood to descend, may go aside, lest it should else rush too strongly upon the Jugular Vein; by which also care is taken, that the blood may not flow back or regurgitate out of the Jugular Vein into the Bosom.
- D. The beginning of the Jugular Vein.

But as the *Carotides* (of whose office and ascent we have hitherto spoken) carry the destinated Tribute of the blood to the Brain; so the *Vertebals* serve chiefly for the watering the *Cerebel* and the hinder part of the oblong Marrow. Hence we observe, because the conformation of the *Cerebel* is alike in Creatures, therefore also the *Vertebral Arteries*, different from the *Carotides*, are found alike in all without any great difference. Nor does there seem to be need of any great provision for the admission or entrance of the *Vertebral Arteries* within the Skull; because, as they carry a lesser portion of the blood, and for that the Blood it self that is bestowed on the *Cerebel*, is wont there to be agitated or moved with no perturbations of passions or conceptions; therefore there is not that necessity that there should be placed any remora or any incitement for its Torrent.

The *Vertebral Artery*, arising from the branch in the fifth Rib, in its whole ascent through the hinder part of the Head, passes through the little holes cut in the extuberances of the *Vertebra*, till it comes near the Basis of the hinder part of the Head; where the same being bent down on either side, and admitted into the Skull by the last hole, excepting where the spinal Marrow goes forth, is carried by the side of the oblong marrow; but as soon as it is brought to the region of the *Cerebel*, it sends forth branches on either side, which cover its superficies, and besides on its back side make infoldings no less signal than those

those commonly called the *Chorooides*, and with larger Kernels more thickly interwoven. As these shoots convey the Juyce requisite for the stilling forth the animal Spirits, so these convey the heated blood and the purified from the serous Colluvies. Further, beneath the Cerebel, both the Vertebral branches, inclining mutually one to another, are united, as it were for that end, that if the flowing of the blood should be stopped on either side, it might be supplied from the other to the whole compass of the Cerebel and its neighbouring parts. These sanguiferous Vessels covering the Cerebel, even as the others do the Brain, make signal in foldings both in its outward superficies, and in that of the oblong marrow, and also within its lappers and folds; from which small shoots are sent forth every where into its under-lying substance, so that from these a subtil liquor, as it were stilled forth and imbibed by the Cortical substance of the Cerebel, seems to go into animal Spirits. By what means, and in what parts of the Head the production of the animal Spirits is performed, remains next to be inquired into.

CHAP. IX.

Shews by what provision, and in what places of the Head the Animal Spirits are begotten: Also other Uses and Accidents of the Pia Mater are added.

FROM the description of the Sanguiducts or Blood-carrying Vessels, which cover and weave about on every side the *Pia Mater*, hitherto handled, we are led by a certain thread to consider by what provision, and in what places of the Brain and its Appendix the production of the animal Spirits is performed.

I. As to the first, it appears from what hath been already said, that the blood is it self the matter out of which the animal Spirits are drawn; and that the Vessels containing and carrying it every where through the whole compass of the Head, are like distillatory Organs, which by circulating more exactly, and as it were subliming the blood, separate its purer and more active particles from the rest, and subtilize them, and at length insinuate those spiritualized into the Brain and its Appendix. Concerning this matter to be distilled, there is care taken, and indeed by the best means, that its stock or provision may be still supplied in fit quality and due quantity.

In respect of the quality, from the whole bloody mass, a portion highly volatile, spirituous, and endowed with active Elements, ought constantly to arise towards the Head; which thing succeeds partly of its own accord, and partly that it might be more commodiously done, care is taken with a certain artificialness; to wit, the Vertebral Arteries, in all Creatures ascending straight, and almost perpendicularly, do in a manner cause, that only the more subtil and light blood is carried upwards, the remaining more thick as it were sinking down for the baser offices of the Limbs and of some of the Bowels. Yea, also the *Carotides* in a man, having an erected head higher than the rest of the parts, and in a Horse in some sort lifting up his face, have also the same privilege; to wit, that by their more steep ascent only the more pure and volatile blood may ascend to the region of the Brain. But in other four-footed beasts, who go with a prone or hanging head, and who have a more frigid and watry blood, which may easily slide into, and too much wash the Brain, this evil is in some part prevented by the wonderful Net and pituitary Glandula joyned to the *Carotides*; which indeed receive the superfluous humidities of the blood, and so make it more pure and free from dregs before it comes to the Brain.

But that the blood may be supplied still in due quantity, to wit, as it were in weight and measure, from the distillatory Vessels, stretched about the compass of the Head, there is a notable provision made in all the *Carotides* about the Basis of the Skull: because their crooked imbowings and branching into infoldings, hinders the too great or too rapid approach of the blood: then, lest the passage of it should at any time be shut up, the mutual ingraftings of all the Vessels on either side, do help or provide for. After this manner, the business of extracting the animal Spirits is performed even as a Chymical Elixir; to wit, great care is taken in the beginning of that Operation, both that choice of matter may be had, and that only a due proportion of it be exposed to the distillation.

The blood by this means, as it were a Chymical work prepared, is carried by the fourfold Chariot of the Arteries to four distinct regions of the Head: and as the sanguiferous Vessels, being distributed with separate ramifications or branches through the whole compass of the Brain and its Appendix, cover all the heights of its compassings about or gyrations, and also its crevices and their gapings and recesses, they bring to their doors the matter to be distilled into the Head every where through the whole circumference of the Brain and Cerebel nigh the Cortical substance of either; out of which as the Spirits are distilled, by this means it is brought about, that they are insinuated into the subjected substance of either. The blood being carried through the narrow infoldings and divarications of the Vessels as it were (as was said) through the serpentine chanel of an Alembick is made extremely subtil,

as much

as much as may be, in its liquor ; in the mean time, what is bloody is received by the little shoots of the Veins associates, or meeting one another every where, and what is ferous by the Kernels every where dispersed ; yet its more purified and spirituous part being carried on further through the very small shoots sent forth on all sides, are instilled more deeply into the very Pores and passages of the Brain and Cerebel, which presently flowing from the Cortical substance into the medullary, there exercise the gifts of the animal Function. What peculiar body and constitutive particles of the Brain it self and Cerebel, conduce to the generation and perfection of the animal Spirits within the substance of either, shall be shewn hereafter, when we treat of the Use of those Parts : now shall be taken notice of what we before mentioned, to wit, that the fluid extillation of the spirituous liquor from the blood about the *Pia Mater*, is performed after a signal manner, both from the ambient heat, which is stirred up from the blood contained within the bosoms, as it were from a *Balneo Mariae*, enriched by the continual flowing of it anew, and also from the obduction of the Meninges, like an Alembick, by which the spirituous Particles, apt to fly away, are constrained and forced into the parts beneath.

But indeed, though the animal Spirits are procreated wholly from the blood, yet the blood watering the Brain and its Appendix, is not only bestowed on this work : for as to the sanguiferous Vessels, which arising out of the Trunks both of the Carotides and the Vertebrales, cover over the whole Head and all its parts and processes ; though many of them, yet not all, are little distillatory chanelles of the animal Spirits. For the animal Spirits are not produced in all places, to which these Vessels reach, for we affirm, that these Spirits are only procreated in the Brain and Cerebel : (which it were easie to prove by the Symptoms which happen in the Apoplexy and Palsie, and shall be afterwards clearly shewn) and from this double fountain of the animal Spirits they flow out into all the rest of the parts, and irradiate, by a constant influence, the whole nervous stock. In the mean time, the oblong marrow and its various processes and protuberances are either retreating places, or high roads for the animal Spirits, procreated in the Brain and Cerebel, and flowing from thence. But for as much as the Arteries and Veins clothe these parts also with a thick series of shoots, and that within the infolding of the Brain the folds called *Chorooides* are hung slack and loosely, these seem to be so made for other reasons, *viz.* both that these parts might be actuated by heat, supplied as it were from a continual fire, and also that the nourishing Juyce might be bestowed on the Spirits which flow there.

As to the first, that the animal Spirits now perfected, may be freely expanded, and irradiate the nervous System, there seems to be required, that the ambient heat, being excited by the blood flowing thither, might open all the little spaces for their passage, and notably dilate or lay open for them ways or roads : wherefore we intimated before, because the little shoots of the Vessels ought not to be deeply inserted into calfous body, (for that, lest the commerce of the Spirits, diverting in this Mart or meeting place, should be disturbed by the perpetual influence of the blood) therefore the infolding of the *Chorooides* is hung under its chamber, that at least by this high situation, as by a Stove or Hot-House, the heat there might be preserved. Besides, we intimated another use of this infolding ; to wit, that the blood, passing through the very narrow *Meanders* and convolutions or rollings about of the Vessels, might lay aside its ferous recrements into the Glandula's or passages of the Veins.

2. But secondly, That many branches and lesser shoots of the same Vessels, which water the Brain and Cerebel, cover also the oblong marrow, and in some measure enter into its Pores and deeper substance (within which the animal Spirits are not begotten, but only exercised and expanded) I say, that this is so made for this other respect ; to wit, that the substance of the oblong marrow might imbibe a constant provision of nourishment from the pouring in of the blood whereof it hath need. For whilst the animal Spirits, flowing into the nervous stock from the Brain and Cerebel, pass through this passage, as it were the high road, some food here ought to be administered to them, as it were in their journey, from the watering blood : For indeed we suppose (which also will afterwards clearly appear) that the oblong marrow, together with the nervous parts, is moistned with a double humor, *viz.* one spirituous and highly active, which flows altogether from the Brain and Cerebel, and being from thence derived into the whole nervous stock, bestows upon them the sensitive and moving Faculties ; and the other humor softer and more oily and sulphureous, which being supplied from the blood, and affused immediately on every part, is the Author of their Heat and Vegetation. Both these Juyces agree among themselves, and being every where joyned together and married, they are as it were a masculine and feminine seed mixed together ; and so they impart to all parts both sense and motion, and all the powers of life and growth. Wherefore it is observed, that all the parts of the whole body, by which motion and sense are performed, do not only swell up with the animal Spirit, of whose influence being deprived, they presently suffer a resolution or loosning ; but also they admit the sanguiferous Vessels ; of whose Tribute if they be defrauded, presently they wither away, or are dis tempered with a mortification or Gangrene. Wherefore, that the flesh, membranes, and all the bones may be watered with the blood, (as may be perceived by the help of a Microscope) the very little or minute bodies of some of the Nerves are surrounded with Capillaments or little hairs of Arteries and Veins, together with their proper Fibrils, that we need not doubt to assert, that the Vessels penetrating the superficies of the Brain and Cerebel, do distil into them a subtil matter for the generation of the animal Spirits ; but that some other shoots of the same Vessels, covering the oblong marrow, do only impart to it heat and nourishing Juyce. Lastly, that the infoldings of the *Chorooides* were built under the chamber of the oblong marrow, chiefly for the dispensing of heat,

and in some measure for the sake of separation of the serous *Latex*. But concerning these, we shall have occasion to speak more largely afterwards, when we shall treat of the nutritious and nervous Juice, and when we shall consider of that famous Controversie, *viz.* whether nourishment is made by the blood or Nerves: further, we shall elsewhere speak more fully of the Nature, Hypostasis, and diverse Disposition of the animal Spirits; also, what the substance of the Brain, and the conformation of the parts, may contribute to their production.

Thus far concerning the *Pia Mater* and the blood-carrying Vessels, which are woven in it, and following its protension, water the whole Head, we have treated largely. But before we quite leave the consideration of this Membrane, we will inquire what sense and motion it may have. Certainly it is not undeservedly that we ascribe the most cruel Head-aches to the more acute sense of this; (in which however, by what means this Meninx is affected, does not so easily appear.) It is the common opinion, that sharp and tormenting Vapours, being raised from the Viscera of the lower Belly, especially from the Ventricle, Hypochondria, or Womb strike against this Membrane, and so pierce it with a pain. But we say, though this be impossible, that Vapours passing so many interstices and bars of the Viscera and bones, without any trouble, should ever come to the Head and hurt it: yet we do not deny, but that sometimes vaporous Effluvia's do proceed from the blood boiling or estuating within the confines of the Brain, which being shut up together under the *Pia Mater*, and as it were gathered into a Cloud, do greatly blow up and distend it, and so distemper it with pain. I have often seen, in a Head newly opened after death, the *Pia Mater* distended, and shining like a Bladder, that the same seemed to be intumefied, with much water included under it; which notwithstanding was found to be so done by wind distending the Membrane, for that being dissected, that Tumor fell down without the effusion of water.

But we think the Head-aches, which happen by reason of the evil of this Membrane, are chiefly excited by another means, to wit, for as much as this Meninx suffers a breach of the unity by the blood boiling up above measure, and rushing into its Pores, and so it is contracted into lighter Convulsions. I have sometimes opened the Heads of the defunct, which when living, were obnoxious to most miserable Head-aches; in which, near the longitudinal solum, where the seat of pains was, the *Pia Mater* or interior, grew to the *Dura Mater* or exterior for some space, oft-times for two fingers breadth, and by their growing together had excited a sharp and unequal Tumor; in which the mouths of the Vessels were so wholly stopped up, that there was left for the blood, though very much boiling up, no passage into the adjoining solum.

As to the motion of this Membrane, we wholly deny, that it hath in it self a perpetual Systole and Diastole; however, the Pulses in some Arteries, have seemed something like it, which have given occasion perchance to this vulgar Opinion. Yet in the mean time, it may be lawful to believe, that this Meninx, for that it is very sensible, is rendred obnoxious to Cramps and convulsive motions: and from its greater contraction the fits of the Falling-sickness do arise, and from its lesser and more partial corrugation or wrinkling together, Head-aches, as hath been said, and also sometimes Scotomies, Vertigoes, and often Convulsions of the Members and Viscera, planted at a great distance from the origine of the Nerves, being drawn into consent.

CHAP. X.

A Description of the Brain, properly so called, and the Explication and Use of its Parts.

WE have thus far beheld the Coverings of the Brain, both the bony and the membranous, also the Arteries and Veins growing and knit to them, like Ivy, and distributed through the whole compass of the Head. There now remains, these coverings being removed, that we next consider the Fabrick and true Hypotype or Character of the Brain and its Appendix, together with the action and use of all the parts. And here at first sight we meet with three things, to wit, the Brain, the oblong Marrow, and Cerebel: of which the oblong marrow seems to be a common Trunk, to which the Brain and Cerebel grow like branches: wherefore some contend the medullary Rope to be the principal part, and the Brain and Cerebel its dependences. But that it is otherwise appears by this, because these bodies, both in the generation and dispensation of the animal Spirits, are of more noble use than the oblong marrow; so that if the out-flowings of the Spirits from the Brain or Cerebel be shut up or hindred, the nervous System presently suffers an Eclipse; in the mean time, if this be primarily distempered, the Brain and Cerebel suffer not for its fault.

That

That we may begin with the Brain, it may be considered in a double respect; to wit, both as to its convex or exterior superficies, as it is beheld in its proper site and position; and as to its interior cavity, to wit, as the Brain appears opened, its concave superficies being expanded and turned upside down. We have already taken care to delineate its true form or Type in either manner, by what hath been before said, to wit, after what manner it is both within and without. There now remains, after its fabrick and conformation being rightly weighed, for us to design its offices, and to shew the uses of it and of every one of its parts. Concerning which, we ought to unfold in general, first, what the office of the whole Brain is; then secondly, when we shall descend to particulars, there will come under consideration, 1. The division of the Brain, to wit, its double Hemisphere, also the two Lobes or partitions of either. 2. The narrow crankling turnings and windings, or the gyrations and convolutions or rolling together of the Brain. 3. Its double substance, viz. Cortical and Medullary. 4. The common Basis of all, viz. the callous body. 5. Its sustentation or *Fornix*. 6. The appension or circuit of the Brain over or above the oblong marrow. 7. And what results from thence, the void space or Ventricles made by its infolding together. Concerning these, we shall take notice of what things occur worth noting; concerning the smelling Nerves and their processes, we shall inquire afterwards, when we shall speak particularly of the Nerves.

1. The Brain is accounted the chief seat of the Rational Soul in a man, and of the sensitive in brute beasts, and indeed as the chief mover in the animal Machine, it is the origine and fountain of all motions and conceptions. But some Functions do chiefly and more immediately belong to the substance of this, and others depend as it were mediately and less necessarily upon it. Among these, which of the former sort are accounted the chief, are the Imagination, Memory, and Appetite. For it seems, that the Imagination is a certain undulation or wavering of the animal Spirits, begun more inwardly in the middle of the Brain, and expanded or stretched out from thence on every side towards its circumference: on the contrary, the act of the Memory consists in the regurgitation or flowing back of the Spirits from the exterior compass of the Brain towards its middle. The Appetite is stirred up, for that the animal Spirits, being some-how moved about the middle of the Brain, tend from thence outwardly towards the nervous System. The rest of the Faculties of this Soul, as Sense and Motion, also the Passions and Instincts merely natural, though they depend in some measure upon the Brain, yet they are properly performed in the oblong Marrow and Cerebel, or proceed from them.

2. In some Animals, the substance of the Brain is divided into two parts, as it were Hemispheres, distinct one from another almost through its whole thickness, even to the callous body, which is instead of a bottom; and in like manner also in all the Sensories, and in most of the other Organs of the necessary Functions, the Brain is as it were twofold, that there might be a provision made against the defect of one side by the supplement of the other. Further, in man, who hath a brain more large and capacious than other Creatures, either Hemisphere is again subdivided into two Lobes, to wit, the Anterior and the Posterior; between which a branch of the Carotidick Artery, being drawn like a bounding River to both, distinguishes them as it were into two Provinces. Certainly, this second partition of the humane Brain also seems to be designed for its greater safety; that if perchance any evil should happen to one or both the foremost Lobes, yet the latter, for that they are separated, may avoid the contagion of the neighbouring and farther spreading evil: So the Brain, like a Castle, divided into many Towers or places of Defence, is thereby made the stronger and harder to be taken.

3. Also the universal frame of the Brain appears yet more divided and variegated within all its aforesaid partitions; for all its whole exterior superficies is made uneven and broken, with turnings and windings and rollings about, almost like those of the Intestines. Those Gyrations or Turnings going from the fore-part of the Brain towards the latter with a creeping compass, and as it were a spiral circuit, encompass both its Hemispheres, that they might mutually furnish all the convolutions with a continued passage: in a more moist Brain, or long kept, the *Pia Mater*, clothing every one, and collecting them together, is easily pulled away; and then the turnings or folds being opened and separated one from another, the substance of the brain is seen to be plowed, or laid as it were with furrows; out of which arise banks or ridges of broken crevices, not in a direct series, but cross-wise; so that the bottom of every furrow, a convulsion arising from the right side, is carried to the left; then others following next, being sent from the left side, is drawn to the right, and so by turns the inequalities of the whole brain are variegated in this order.

If it be inquired into, what benefit its Turnings and Convolutions afford to the brain, or for what end its whole anfractuons or broken crankling frame is, we say that the brain is so framed, both for the more plentiful reception of the spirituous aliment, and also for the more commodious dispensation of the animal Spirits for some uses. As to the aliment to be bestowed on the brain, because it is required to be subtil and extremely wrought or elaborated; therefore it ought to be admitted, not by a more open passage, but only by very small pores and passages. Wherefore that there might be sufficient plenty of spirituous liquor supplied, it is not only drunk in every where in the plain superficies of the brain from its Cortical substance; but that superficies of the brain or Cortical substance is uneven and rough with folds and turnings about; that the spaces for the receiving the Juyce might be enlarged as much as may be: For the anfractuons or crankling brain, like a plot of ground, planted every where with nooks and corners, and danks and mole hills, hath a far more ample extension, than if its superficies were plain and even

Further

Further, those cranklings of the brain do more fitly hide the sanguiferous Vessels, for that they are very small and slender, and more safely keep them, being variously interwoven into one another's infoldings, than if they should be openly distributed; for so being carelessly laid, they would be liable to too frequent hurt.

But a reason and necessity of the turnings about the brain, and not of lesser moment than the other, is fetched from the dispensation of the animal Spirits. For as the animal Spirits, for the various acts of Imagination and Memory, ought to be moved within certain and distinct limited or bounded places, and those motions to be often iterated or repeated through the same tracts or paths: for that reason, these manifold convolutions and infoldings of the brain are required for these divers manners of ordinations of the animal Spirits, to wit, that in these Cells or Store-houses severally placed, might be kept the species of sensible things, and as occasion serves, may be taken from thence. Hence these folds or rollings about are far more and greater in a man than in any other living Creature, to wit, for the various and manifold actings of the superior Faculties; but they are garnished with an uncertain, and as it were fortuitous series, that the exercises of the animal Function might be free and changeable, and not determined to one. Those Gyration or Turnings about in four footed beasts are fewer, and in some, as in a Cat, they are found to be in a certain figure and order: wherefore this Brute thinks on, or remembers scarce any thing but what the instincts and needs of Nature suggest. In the lesser four-footed beasts, also in Fowls and Fishes, the superficies of the brain being plain and even, wants all cranklings and turnings about; wherefore these sort of Animals comprehend or learn by imitation fewer things, and those almost only of one kind; for that in such, distinct Cells, and parted one from another, are wanting, in which the divers Species and Ideas of things are kept apart.

But that in more perfect Animals, all the turnings about are made of a twofold substance, *viz.* Cortical and Medullary: the reason seems to be, that one part may serve for the production of the animal Spirits, and the other for their exercise and dispensation. For we may well think, that the animal Spirits are wholly or for the most part procreated in the Cortical substance of the brain; for this severs and receives immediately from the blood the subtil liquor, and imbuing it with a volatile Salt, exalts it into very pure Spirits. It is obvious to every one, that the Arteries enter the *Cortex* of the brain with a more frequent insertion of shoots, and instil to it a spirituous liquor; the leavings of which, or what is superfluous, the Veins in like manner entering it, do sup up and carry away; in the mean time, the more subtil portion being here set free, goes into Spirits. In truth, the blood waters the medullary substance of the brain in a very small quantity; which seems truly to be rather for the sake of exciting of heat, than that the animal Spirits should there be generated by the flowing in of that blood. For indeed, the volatile Salt, which like Ferment, spiritualizes the subtil liquor stilled forth from the blood, is had more copiously in the *Cortex* of the brain, rather than in its middle or marrowy part; because that part being endued with an Ashy colour, shews by its aspect the spermatick Particles and Humor contained in them, in which Spirit and a volatile Salt very much abounds; yea and plainly resembles on Armeniack smell, (such as either part alike breathe forth.) In the mean time, the medullary part of the brain seems very like the oblong marrow and the spinal. But it is well enough known, that these medullary parts serve for the exercise and dispensation of the animal Spirits, and not for their generation. The sign of which is, that where-ever an obstruction happens in them, whatever is below, being destitute of the influx of the Spirits, suffers an Eclipse; whence it follows, that the animal Spirits, irradiating the medullary Rope, are not produced in it, but flow in from elsewhere; and why should we not think the same of the middle marrow of the brain? Truly, that this part is rather the Mart or Exchange of the Spirits than its Shop or Work-house, appears from hence, because the Animals which excel in Memory, Imagination, and Appetite, are furnished with a more ample marrow of the brain; as is observed in man and the more perfect four footed beasts: and they who seem to have little need of those Faculties, as the lesser four-footed beasts, also Fowls and Fishes have the *Cortex* of the brain greater, but the medullary part very small. It is a familiar Experiment among Boys to thrust a needle through the head of a Hen, and that she in the mean time, whose brain is so pierced through, shall live and be well a long time. The reason of which is, because the whole substance of the brain in these sort of Animals is almost merely Cortical; wherefore from the suffering such a hurt, (as long as the marrow remains unhurt) the Spirits are generated in a lesser quantity, but their commerce to the necessities of life, are not therefore presently interrupted. Indeed the brains of Birds consist almost wholly of a Cortical and Ashy part; and the medullary part is exceeding small, and is only like a smaller Nerve descending on either side from the substance of the brain it self.

After the animal Spirits are begot by a constant afflux of the blood within the *Cortex* of the Brain, being there begotten, having obtained a watry Vehicle, they flow presently more inwardly, and soon enter into the marrows, filling the furrows and baulks of all the turning and winding Crevices; from whence being carried farther through all the particular tracts of each marrow into the marrowy substance, which lyes under all the winding Crevices, as their common Basis, they are brought at last into the *Callous Body*, as into a spacious field; where, as in a free and open place, these Spirits being newly produced, are expatiated or issue forth.

5. Indeed this medullary substance called the *Callous Body*, which chambering the more inward superficies of the brain, receives into it self the marrow of all the turning Crevices, seems to be made for that end, and disposed there for the same purpose; to wit, that the Spirits flowing into it on every side, might be stretched out as in their proper Sphere, and begin to exercise the acts of the animal Faculties. In this place, they which come out of the several winding Crevices, do meet together, and remain as in a publick *Emporium* or Mart; from whence, as occasion serves, they are raised up, and drawn forth for the uses of every Faculty. But whilst they here remain at leisure and not busied, they become purified or refined more and more by a continual circulation: because these Spirits new-born, do gently and perpetually flow on every side from the outmost bounds of this body (to wit, where this common marrow besmears the hinder productions of the brain, or the border of either of its Hemispheres) towards the fore-part of this *callous Body*, where it is thickest; and there, if there be need, they are employed on the act of the Imagination, or entering the shanks of the *oblong Marrow*, they actuate and inspire the nervous *Appendix*: but what Spirits are remaining there, after these offices are served, run forthwith into the *Fornix*, and passing through its passage, they are remanded back again to the hinder region of the brain by a certain circulation; and lastly, after this manner, penetrating through the narrow passages of the *Fornix*, those Spirits are made more subtil, and also, as it seems most likely, they perform in this circular motion those more subtil acts of the Phantasie.

6. Truly, that we may here speak something of the *Fornix*, it seems that this part serves for a twofold use: viz. first, lest more inward sides of the Brain hanging slack and loosely, might fall together among themselves, or might be removed beyond the limits of a just protension or out-stretching; for they not only by the coming between of the *Pia Mater*, and by little cords drawn from it, cohere to the oblong marrow and the Cerebel; but besides, the *Fornix*, like a Ligament or string brought from one end of the brain to the other, constrains and keeps its whole frame in its due figure and situation. For this part purely medullary, and of the same substance with the *callous Body*, seems to be a certain process of this, which arising more forward between the streaked bodies, and falling upon the two shanks of the oblong marrow, first of all distinguishes them; afterwards, being separated from them, is carried through the midst of the cavity, and about the hinder part of the brain is divided as it were into two Arms, which being bent on both sides, and again cleaving to the border of the *callous Body*, strictly embrace the oblong marrow, and knit and firmly tie the hinder bulk of the brain to its Trunk, lest it should flow or slide forth. But the other, and that the more noted use of the *Fornix* seems to be what we but now mentioned; to wit, that the animal Spirits may immediately pass through its passage from one end of the brain to the other, and so, as it were through the bill of a *Pelican*, they might be circulated into their own intorted belly.

That those things were but now declared concerning the *Penetratia* and inward recesses of the Brain, may be the better understood, we will here add a Scheme of its Sphere turned inside out, and stretched out as it were upon a plain, so that the concave and inmost superficies of the *callous Body*, together with the *Fornix*, may be sufficiently seen.

The Seventh Figure

Shews the Brain of a Sheep bent back and cut a little open in the places where they stick together near the streaked Bodies, that its interior substance may be turned the inside out, and unfolded on a plain.

- AA. The substance of the Brain cut asunder, which in its natural situation being folded together, did cohere with the rest of its substance a. a. upon the remaining streaked Bodies.
- B. The Trunk of the *Fornix* or *Piloides* cut asunder, which in its natural site coheres with the Basis of the same *Fornix* E.
- CC. The Arms of the *Fornix* which embrace the medullary Trunk on the other side of the Pineal Glandula.
- DD. The brim of the *callous Body* which embraces the medullary Trunk near the Cerebel.
- E. The Basis of the *Fornix*.
- FF. Two straight Roots of the *Fornix* lying between the streaked Bodies.
- GG. The transvers medullary Process knitting the two streaked Bodies one to another.
- H. The Chink near the Roots of the *Fornix* leading to the Tunnel.
- I. The streaked Bodies, whose Superficies the small Arteries and Veins cover over.
- KK. The interior Superficies of the *callous Body* marked with transverse medullary streaks or chamferatings, or reaching from one Hemisphere of the Brain to the other.
- LL. The Chambers or hollow places of the Optick Nerve.
- M. The anterior hole leading to the Ventricle lying under the orbicular Protuberances, which also goes slope-wise to the Tunnel.
- N. The Pineal Glandula which appears more plain, the *Pia Mater* and the Choroidal infolding being separated and removed.
- OO. The Natiform or Buttock like Protuberances, which are herefar greater than in a Man or Dog.
- PP. The lesser Protuberances called *Tettes*, which are additions or things growing out of the former.

- QQ. The medullary Processes stretching from the Testes into the middle or marrowy part of the Cerebel.
 R. The meeting together of those Processes.
 SS. The Pathetick Nerves of the Eyes arising out of the meeting together of those Processes.
 T. The posterior hole leading into the Ventricle, lying under the orbicular Protuberances, and also into the same opening of the Tunnel.
 V. A Furrow in the medullary Trunk, which being covered by the Cerebel, makes the fourth Ventricle.
 WW. The Ramifications or Branchings of the medullary substance of the Cerebel, which appear like a Tree.
 X. The end of the oblong Marrow about to go into the Spinal.

CHAP. XI.

Shews with what motion and tendency of the Animal Spirits, the Exercises of the Animal Faculties are performed within the Confiners of the Brain : Also what the use of its Ventricles is.

Hitherto setting forth the uses and offices of the Brain, properly so called, and of its parts, we have shewed after what manner the animal Spirits are procreated from the blood in this their principal Shop or Work-house; and into what diverting places, they being newly brought forth, do depart of themselves, and are there kept as it were in distinct Cloisters or Cells to be drawn forth for the manifold Exercises of the animal Function. But because these Spirits, so brought to perfection, and ready for their work within the same parts of the Brain, enter into other manner of motions, and divers ways of emanations; therefore before we proceed any further, for the searching out their tracts within the oblong Marrow and Cerebel, we ought to declare concerning these Spirits disposed within the confines of the Brain it self, with what forces they are furnished, in what form they unfold themselves, and in what ways they diffuse themselves and go forward as often as being mustered in due order, they produce the acts of the Imagination, Memory, Appetite, and other superior Faculties of the Soul. But for as much as hereafter, when we have finished the explication of the Head and nervous Appendix, we have resolved, for a conclusion, to treat of the Soul of Brutes and its powers, I may therefore for the present lay aside this task; unless that in the mean time it may not seem amiss to give a taste only in general of these few things: viz. as there are two parts of the inferior Soul, or of Beasts, to wit, the vital or flamy, being inkindled in the blood, and the sensitive or lucid, being diffused through the whole Head and its nervous dependences, the animal Spirits being continually produced in the Brain and in the Cerebel, do constitute a double as it were Root or Fountain of this lucid part: yea, the Spirits of either lineage, for as much as they are continued both within those Fountains, and from thence through the frame or substance of the nervous System, as it were under the same beamy *Systasis* and contexture, they effect or cause the whole *Hypostasis* or subsistency of the sensitive Soul.

But there happen to this Soul, because it is apt to be moved with a various impulse, and so to contract or dilate its species in the whole, or in part, for that reason divers manners both of Actions and of Passions, to wit, the Senses, which we call its Passions; and Motions, which we name the Actions of the same. The formal reason of the former, viz. the Senses, consists in the retraction or drawing back of the Spirits, or a flowing back towards their Fountains. For where-ever the impression of a sensible object is carried to this radiant or beamy contexture, presently either the whole frame, or some portion of it, whereby it admits the species, is compelled to wag, and to be moved back, as it were to leap back and recede into it self: on the contrary, the actions or motions of this Soul are made, for that this shadowy Spirit, being incited or stirred up in the whole, or in a certain part, unfolds it self more largely, and by an emanation, and as it were a certain vibration of the Spirits, exerts or puts forth its virtue and force of acting.

Both the Senses and Motions of this sensitive Soul are made either transient, when the Spirits, or its constitutive Particles, being moved somewhere in the System of the Nerves, draw together with them the containing parts, and deflect them with the like carriage or gesture with themselves, as is observed in the five outward Senses, and the local motions of the Members: or else, either both Actions and Passions are continuing, to wit, when both the Motions and Senses are silently performed without any great agitation or moving of the body, or its parts, within the first Fountains of the Soul, viz. the Head it self. These kind of Passions indeed, made within the substance of the Brain, are the common Sense and Imagination; but the Actions are Memory, Phantasie, and Appetite: and either of these, as to their beginnings and instincts, depend for the most part upon the outward Senses.

Concerning the former, we take notice, that as often as the exterior part of the Soul being struck, a sensible impression, as it were the Optick Species, or as an undulation or waving of waters, is carried more inward, bending towards the chamfered bodies, a perception or inward sense of the Sensation outwardly had or received, arises. If that this impression, being carried farther, passes through the *callous Body*, Imagination follows the Sense: Then if the same fluctuation of Spirits is struck against the *Cortex* of the Brain, as its utmost banks, it impresses on it the image or character of the sensible Object, which, when it is afterwards reflected or bent back, raises up the memory of the same thing.

The active Powers of this Soul, *viz.* Local Motion, Memory, Phantasie, and Appetite follow sometimes immediately the Passions, sometimes are induced apart from them upon other occasions. For indeed the sensible impression striking the streaked or chamfered bodies, oftentimes, the Brain being in no wise affected, causes the local Motions to be retorted with a reciprocal tendency of the animal Spirits, so in sleep (the Appetite knowing nothing of it) when pain troubles, presently we rub the place, moving the hand to it: but more often, after that the sensible Species, having past from the common Sensory to the *callous body*, hath stirred up the Imagination, the Spirits, reflecting from thence, and flowing back towards the nervous Appendix, raise up the Appetite and Local Motions, the Executors or Performers of the same: And sometimes a certain sensible impression, being carried beyond the *callous Body*, and striking against the *Cortex* of the Brain it self, raises up other Species lying hid there; and so induces Memory, with Phantasie, also often with Appetite and Local Motion associates. Further, these active Powers, sometimes upon other occasions, are wont to be stirred up and exercised apart from Passion. In Man, the Rational Soul variously moves the sensitive, and at its pleasure draws forth and brings into act its Powers, sometimes these, sometimes those. Moreover, the blood boiling up above measure, and by that means striking impetuously the border of the Brain, excites the species of things lurking in it, and driving them forward towards the middle or marrowy part of the Brain, causes also the various Acts of the Phantasie and Memory to be represented.

Concerning the aforesaid interior or abiding Faculties, we shall at present further take notice, that their more perfect Exercises are chiefly and almost only performed by the Spirits already perfected and highly elaborated; for those a making, or that are new made, being numerous, they very much obstruct and hinder the acts of the animal Function: to wit, when from the Vessels, on every side watering the *Cortex* of the Brain, the subtil-Liquor is plentifully intilled for the matter of the Animal Spirits, this flowing inwardly stuffs all the pores and passages of the Brain, and so excludes for that time the Spirits from their wonted tracts and orbs of expansion. Wherefore whilst the chief reflection of the Brain and Spirits is celebrated, sleep, or an Eclipse of the animal Spirits happens; then waking returns, when from the Liquor intilleds the more subtil part is exalted into very pure Spirits, and at length the more watry, being partly resolved into Vapours, is exhaled; and partly supped up by the passages of the Veins entering the substance of the Brain, or else is sweat out into the vacuity lying under the *callous Body*. Concerning these I hope we may discourse more largely afterwards. In the mean time, that we may proceed to the rest of the things proposed, concerning the frame of the Brain, properly so called, there yet remains that we speak of its Ventricles: But since they are only a vacuity resulting from the folding up of its exterior border, I see no reason we have to discourse much of their office, no more than Astronomers are wont of the empty space contained within the vacuity of the Sphere.

But in truth, as there is nothing met with in Nature that is not destinated to some use, surely we suspect this same *Vacuum* or empty space not to be built in vain within the Globe of the Brain. The Ancients have so magnified this Cavern, that they affirmed it the Shop of the Animal Spirits, both where they themselves were procreated, and performed the chief works of the animal Function. But on the other side, the Moderns or those of later days have esteemed these places so vile, that they have affirmed the same to be mere sinks for the carrying out the excrementitious matter. But indeed that opinion of the Ancients is easily overthrown, for that the animal Spirits, being very subtil, and apt to fly away, require not such large and open spaces, rather than the more narrow passages and little pores, such as are made in the substance of the Brain: for these Spirits (because they ought, for the various Faculties of the Soul, to be composed into various series, and divers orders and dispositions, therefore) ought to be moved within peculiar orbs and tracts. Further, if any one shall exactly consider the fabrick of the Brain, and seriously weigh, that these Ventricles are not formed out of the primary intention of Nature, but result only secondarily and accidentally from the complication of the Brain, he will be far from thinking, that the supreme seat of the Soul is fixed there, where being hem'd in with a most noble Guard of Spirits, it doth execute and perform its Functions. For it neither appears at all out of what matter, and by what artifice the Spirits are there begotten, nor by what ways of emanation they are derived from thence into the other parts of the Brain and nervous System. Wherefore almost all Anatomists, who are of a later Age, have attributed that vile office of a Jakes or sink to this more inward chamber of the Brain. To which Opinion there has been some trust given, for that these Ventricles are often seen in the dead to be filled with water; also from these ways seem to lye open for excretion, both towards the Tunnel, and also into the Sieve-like Bone. It is observed, that where-ever the blood flows more copiously into any part, and waters it, there Vapors or watry Humors are begotten from the superfluous Serum left in the circulation, which for the most part either exhale out through vaporious *Effluvia's*, or are brought back into the blood by the Veins or Lymphatick Vessels. But when the blood, by a plentiful influx, waters not only the *Cortex* of the Brain, but

the interior marrow also, it remains, that the serous *Latex* (when-ever it abounds more in the blood, than that its superfluities may be reduced immediately by the Veins, or by the Lymphaducts, if they be there, or may be separated by the Glandula's) should slide down into this den, made hollow within the infolding of the Brain. Truly there are many instances, which plainly evince, that the serous humors are ordinarily laid up in the Ventricles of the Brain. Anatomical Observations of men dying of many Cephalick diseases, and especially of soporiferous or sleepy distempers, confirm this. Yea, it may be lawfully thought, that natural sleep follows, for that the Pores and passages of the Brain are occupied and stuffed with a watry *Latex*, which serves for a Vehicle to the Spirits. Then as often as a profound sleep invades any one from a Surfeit, or drinking of Wine, the cause is, that the little spaces in the medullary substance of the Brain, destinated for the motions of the Spirits, are too much obstructed by a Narcotick or a watry humor: certain reliques of which, being resolved into vapor, and thrust out from the company of the Spirits, do often sweat out, or drop into this *Vacuum* or empty space.

After this manner, it may be believed concerning the Ventricles of the Brain, or the empty space left within its plicature or folding together. But in truth, because this matter hath been very much controverted among Physicians of every Age, and the right decision of it seems to be of great moment, for the explicating the offices of the other parts of the Head; I will here compare together the reasons for and against this Opinion, that we may at length give our Judgment of this Opinion, what may be either true, or most likely.

CHAP. XII.

It is inquired into, whether the serous Humors, heaped together within the Vacuity of the Brain, be sent out by the Pituitary Glandula and the Sieve-like Bone, or not?

Since Experience testifies, that the Serum and excrementitious, I may justly say morbid, and oftentimes deadly Humors, are found frequently within these Ventricles of the Brain; we ought to enquire more diligently concerning their passage in and out: and the rather, for that it is very much doubted by some concerning the use of these Dens, nor are there wanting those in this late Age, who have endeavoured to bring into vogue the ancient Opinion, though long since exploded, concerning the Spirits being begot in this place, and here exercised. I believe without doubting, for the reasons before alledged; that the Spirits are not here begotten, nor exercised: and no less certain is it made by Experience, that the serous Collavies is here often gathered together. This therefore only remains, that we should see from whence, and how this flows hither, and then by what ways of Excretion the same should be carried out.

As to the first, it is exceeding probable, that the serous *Latex*, which is the Vehicle of the Spirits newly produced, and is introduced together with them into the Pores of the Brain, after it is grown stale, and being attenuated into Vapour, doth distil forth into this Cavern, and there at last grows into a watry Humor: for otherwise what becomes of that Humor, or into what other Receptacle could it be derived? Besides this ordinary, and I believe assiduous heaping together of the serous Collavies within the Ventricles of the Brain, certainly it may be believed, that this kind of serous Humor is distilled out of the Glandula's inserted in the *Choroideal* infolding, being too much filled, into the Ventricles so called. I have often seen in a Dropsie the Glandula's of the Brain to be intumefied, and like grains of Barley, bursting with too much wet, to become flaccid or withered, so that they could not retain the serosities brought to them, but continually disposed them into the Cavity beneath. Truly in a Dropsie of the Brain these Cavities or Ventricles are always seen to be full of water; the cause of which kind of distemper is, the blood being made more watry, puts off in its circulation a greater heap of Serum than the Veins can presently carry back, or the Glandula's are able to receive and retain. For indeed, that the Serum, redounding on every side from the Vessels, may the better slide into the Ventricles of the Brain, it is so ordered, that the greater infoldings of the Vessels, with the inserted Glandula's, should be disposed near all the Ventricles of the Head: because, not only the infolding *Choroidea* is placed nigh the concurrence of the three Ventricles in the Brain, but another infolding, and no less noted, (which we have above described) with greater Glandula's, is set behind the Cerebrum nigh the fourth Ventricle. In all, as it seems, for that end such care is taken, that the watry part, coming from the blood, which is destinated either for the Brain or the Cerebrum, for that it is not fit for the procreating of Spirits, might run into these infoldings of the Vessels. But yet if a greater plenty of Serum be there laid up, than can be contained in them, or may be sent away outwardly, whatever is superfluous will slide into the Cavity underneath.

Hence it appears, from whence, and by what means the serous heap is gathered together within the Ventricles of the Brain : certainly to deny this going out is no other than to assert every ones Brain big with a Viper, which cannot be brought forth but by gnawing asunder the bowels of its parent. Who shall lightly consider the parts nigh the Ventricles, and their Fabricks, at first sight only would swear with the Ancients, that the excrements of the Brain were laid aside both lower through the Tunnel into the Palate, and above or more forward through the mammillary Processes into the Nostrils : But if the structure of these parts be a little more diligently searched into, there is no body who presently will not easily think, that by neither of these ways the excretion of any humor can be made ; for neither from the pituitary Glandula through the Wedge-like bone, nor from the mammillary Processes through the holes of the Sieve-like bone, is there any manifest aperture or opening to be perceived. But in very truth, we do suppose that the Brain is in some measure purged by both these Emunctories, for that objection may be answered, That the translations of Humors in living Creatures are easily performed through places that seem impervious or unpassable ; for while the Pores and passages in all the parts of a living Creature are dilated by spirit and heat, they transmit the rain of the Serum as through the fine texture of a woollen Cloth. This plainly appears from Athritick distempers, in which the serous *Latex* creeps by degrees through the nervous bodies, and passing through very small spaces, makes a falling down of humors sometimes upon these parts, and sometimes upon others ; so that it is obvious, that the Membranes and nervous Processes drink in the serous humors like Sponges, and then by a light compression render them by heaps, as is manifest in the Tooth-ach ; for as often as a Bodkin or Instrument is put up into a hollow Tooth, clear water will come out plentifully. Indeed, in the body of a living Creature the passages of humors are not only made through open passages and chanel ; but the thinner and more watry *Latex* creeps through the solid and smooth bodies of the Nerves, as also the Fibres and the Membranes, as through the holes of a Filtre, and so is transferred through imperceptible straits from place to place. I sometime knew in the Impostume of the Lungs the humor to have been derived through the Membranes growing to the *Pleura* from the bag into an Issue made in the side, and so the spitting ceasing, the Disease that seemed otherwise incurable, was healed by such a way of Evacuation. Why in like manner may we not suppose the serous humors falling down from the Ventricles of the Brain into the pituitary Glandula, and the mammillary Processes to be carried away through the Nerves or Membranes passing through here or there ?

Concerning the Tunnel, the thing is probable enough ; because the position and structure of this seem to shew, that some humor is carried out of the Ventricles of the Brain towards the pituitary Glandula. For this part is so constituted, that a falling down of the humors may be made from every angle and recess of the interior Brain and its Appendix into its aperture or opening. And as in several Animals, the figure and site of the Ventricles vary very much, (as we have already shewn) yet in every one of them all the Ventricles of the Head, whatsoever they be, have their openings gaping towards the Tunnel. But that this Kernel or Glandula, to which the passage of the Tunnel is inserted, receives and carries out the serous humors, seems also to appear from hence ; because it admits, not only those falling from the Brain into its Pores, but also those secreted from the blood ascending into the Brain : For that in many four-footed beasts, certain Vessels are inserted to this Glandula from either Carotidick Artery, which intimately enters its substance : a sign of which is, that Ink being injected into the Trunk of either Artery, dyes with a black colour the wonderful Net, if it be there, and oftner the interior substance of this Glandula : whence it may be argued, that the office of this Glandula is to receive the superfluous serosities ; and it receives not only those sent away in the return from the Brain, but sometimes preoccupies or prevents them, and is wont to derive them from the blood before it is carried to the Brain. And therefore this Glandula is very small, if the superfluities of the Serum be derived to it only from the Brain ; but greater, if they come to it also from the blood, to wit, as it executes either one or a double office, as we have already shewn at large.

But as to what respects the way of passing through, to wit, by which the humors deposited in this Glandula, are carried out, the vulgar Opinion is, that they do come away through the holes of the bone beneath into the Palate : wherefore in those kind of Animals, who have the wonderful Net, and many of its shoots enter this Glandula, more holes are made in the underlying Bone. Further, if you take away the ditch or gutter of the Wedge-like bone, or the seat of this Glandula cut off from the Skull, and pour water upon its holes being made bare from the Membrane, it passing presently through the substance of the whole bone, will suddenly still forth through other holes lying open in the sides of the bone. Yet this Experiment concludes nothing for the Opinion proposed : because these holes are wholly wanting in some Creatures, and very much in an humane Skull ; in those who have them, as in a Calf, especially it is observed, that the same are filled by some hollow Vessels ; into which, if a black liquor be cast by a Syringe, that passing through the substance of the bone, will go into many other Vessels lying under the bone, and at length into the Trunk of the Jugular Vein ; which certainly is a sign that the humors are not carried from hence into the Palate. But as to the Vessels which cover over the holes of the bone, and which more abundantly lye under the same, they seem to be either Veins or Lymphæducts.

But among these it is lawful to conjecture, the chief means of Excretion, whereby the serous humors, laid up in the pituitary Kernel, may be carried out ; to wit, that they are remanded back from it, as from most other Glandula's or Kernels, into the mass of blood. In a Calf the thing lies open

to ocular Inspection, nor is it to be doubted of other Animals, who have the admirable Net : because as the arterious branches, so also the veinous reach to this Glandula ; which sup up not only the humors deposited from the Arteries, but also those falling from the Ventricles of the Brain. Yea, it may be lawfully believed, that in a Man also, a Horse, and in other Creatures, who want the strange or wonderful Net, there are other Lymphæducts or Water-carriers, or such kind of Vessels, as are seen in the head of a Calf, that most certainly carry the humors from this Glandula. We cannot so easily find out their footsteps, because, before these break out of their dens, the tracts of the Lymphæducts, if there be any, would vanish. Nor can we find out these Vessels in all, as in a Calf, by injection ; because the holes of the bone, by which, as by the leading of a thread, the injection arrives at, and dyes the Vessels, otherwise lying hid, are wanting in most. No doubt but time will render sufficiently manifest the reductions of the humors from the pituitary Glandula in other living Creatures : in the mean time, it may be lawfully suspected, for that the serosities in some are remanded from thence into the bloody mass, that in all it is done after the like or the same manner, although the ways of the passing do not yet sufficiently lye open.

As to the other Emunctory of the Brain, to wit, whereby the serous humors, laid aside from the Ventricles of the Brain into the mammillary Processes, and thence are thought to be sent away through the holes of the Sieve-like bone. truly, concerning this way of Excretion, it is much more to be doubted, because these holes in the defunct being covered over and fully stufed, with the insertions of the *Dura Mater* and nervous Fibres, sent on either side from the mammillary Process, transmit nothing of humor, how clear soever it be. • Further, there is nothing more certain, than that the serous humors are pressed out from the Glandula's and extremities of the Vessels ending within the Nostrils into their Cavens ; so besides that 'tis scarce possible for the humors to descend thither from the Brain, it is not absolutely needful to suppose this sort of means of Excretion. But that we may reason a little farther concerning these ; if it may be lawful to argue from the provision, and from the effects of the parts, there is no reason but that I may probably believe, that some humors also do shower down from the Brain into the cavities of the Nostrils : for it being supposed, that the serous humor passes through, not only open chanel, but the more strict Pores and passages also of the Nerves, and creeping both through the Fibres and Membranes, as through the strainings or holes of a Filter or Strainer, is carried from place to place, (which it were easie to demonstrate) what should hinder but that the same sort of *Latex* may descend through the Fibres impacted in the holes of the straining bone ? For although in dead creatures those parts seem to be impervious or unpassable, yet during the life of the Animal the passages and blind ways of the nervous bodies, being dilated by Spirit and Heat, most easily transmit a copious humor wherewith they are watered.

The Sieve-like Bone in divers Animals is variously perforated for the manifold necessity and difference of smelling. A Process from the *Dura Mater* and manifold nervous Fibres pass through every one of its holes, and besmear the inside of the Nostrils. But as the impressions of sensible things, or sensible Species, continued as it were by the undulation or waving of the animal Spirits, ascend through the passages of these bodies stretched out from the Organ towards the Sensory ; so the humidities watering the same bodies, for as much as sometimes they may be more superfluous than usual, may distil into the Nostrils through the same ways. For indeed such humors as are perpetually to be sent away from the brain, ought so copiously to be poured upon the Organs of Smelling, as we shall shew hereafter, when we shall speak particularly of the Smelling Nerves ; in the mean time, that there is such a way of Excretion opening into the Nostrils, some observations, taken of sick people troubled with Cephalick diseases, do further perswade. I have known some very obnoxious to the Scotomy and Vertiginous distempers, who had great plenty of clear water that distilled forth about the end of the Fit ; by which kind of Evacuation, it were Critical, the Fit was wont to be ended. Not long since, a Virgin living in this City, was afflicted a long time with a most cruel Head-ach, and in the midst of her pain much and thin yellow Serum daily flowed out from her Nostrils : the last Winter this Excretion stopped for some time, and then the sick party growing worse in her Head, fell into cruel Convulsions, with a stupidity ; and within three days dyed Apoplectical. Her Head being opened, that kind of yellow *Latex* overflowed the deeper turnings and windings of the Brain, and its interior Cavity or Ventricles. I knew a Gentlewoman that was wont to be infested with a most cruel Head-ach, also with a *Vertigo*, and a frequent melting of the Animal Spirits, or Swooning away ; who when she began to be better after a grievous Fit, felt at first a creeping motion in the top of her Brain, as it were the sliding down of water : then that motion passing a little more forwards and downwards, at length many drops of clear water distilled from her Nostrils. This Symptom she used to have so ordinarily, that the sick Gentlewoman did not doubt but that this water stilled out from the Brain it self. I could here bring many other reasons, which might seem to perswade, that the Ventricles of the Brain, or the Cavity made by the complicature or folding up of its border, is a mere sink of the excrementitious Humor ; and that the humors there congested, are purged out by the Nose and Palate : But it is time for us to hasten to other matters, and to pass from the Brain, properly so called, to its Appendix, viz. the oblong Marrow and the Cerebel.

CHAP. XIII.

The Actions and Uses of the oblong Marrow, and some of its Parts are unfolded.

WE will pass now from the Brain to the explication of its Trunk, to which both it and the Cerebel do grow like Mushrooms or large Excrecences. This part is commonly called the Oblong Marrow; under which name we comprehend all that substance which reaches from the inmost Cavity of the callous body, and conjuncture in the Basis of the Head, to the hole of the hinder part of the Head; where the same substance, being yet farther continued, ends in the spinal Marrow. The superficies of the oblong Marrow, though it be made unequal with some protuberances and processes, yet it is not variegated or garnished with any turnings about, and involutions, as it is in the Brain and Cerebel; neither is its exterior and cortical substance, or of an Ash-colour, and the interior, medullar or marrowy and white; but all its frame or substance is in a sort marrowy or medullous: nor does it however appear pure and bright, but much darkened with fibres and hairs variously stretched forth, and diversly going out. To wit, its fibres being figured in various places, after a diverse manner, in some places they are found chamfered, and as it were beamy, in others direct or stretched out at length, and in other places again circular.

The Figure of this is forked, and as it were like the Poets *Parnassus*, seems like the letter Y: for its shanks arising more forward from either Hemisphere of the Brain, and inclining one to another, grow together near the centre of the Skull into one and the same Trunk; which notwithstanding, a line being brought through the midst, seems to be made as it were out of two stalks, and those to be distinguished in its whole process.

The oblong Marrow seems to be a broad or high Road, into which the Animal Spirits perpetually flow from their double Fountain, to wit, the Brain and the Cerebel, to be derived from thence into all the nervous parts of the whole Body; which Spirits, whilst they are orderly disposed in this common passage, as it were by series and orders, carry a twofold aspect; to wit, they are directed either outward towards the Nerves, when they exert the loco-motive Faculty, or they look inward towards their Fountains, when the acts of sense, or rather the apprehensions of sensible things are performed.

Within this open way, a more large and greatly open path leads straight to the spinal Marrow, through which the Spirits flow forth to the Nerves, the Executors of spontaneous motion in most Members. In the mean time, out of the same tract of the oblong Marrow, lesser paths are carried outwardly, here and there, by particular Nerves, arising from the same, within the Skull. Also besides, many diverting places, viz. various processes and protuberances grow to this medullary Trunk, into which, the Spirits destinated to some peculiar offices, go apart: lest that all the Spirits travelling this way, and that way in the same path, should meet one the other and disturb one anothers offices.

Whilst after this manner, for the performing the acts of Motion and Sense, we suppose the Animal Spirits to be expatiated within the oblong Marrow; we affirm, that they are not there begotten, but only exercised. For indeed, they being created only in the Brain and Cerebel, as they proceed from this or that, they perform the offices, either of a merely involuntary Function, or else of a spontaneous, as shall be shewed more largely hereafter.

But that we may unfold here all things which belong to the oblong Marrow, I shall mete it forth from its first coming out to the end of its race, and handle its several *Stadia*, diverting places, and cross ways. Where the callous Body is thought to end, the oblong Marrow begins, to wit, when the medullar substance of the Brain is thickest nigh the bosses or knobs of either Hemisphere, a body of a whitish colour and somewhat darkned or obscured, and streaked like Ivory, is joyned to that Marrow on both sides. These two bodies are the extremities or tops of the shanks of the oblong Marrow; between which and the Brain there are nigh and very immediate commerces. Either of these seems as it were a Cylinder rolled about into an Orb, which nevertheless constitutes the top of either shank, not spherical, but oval, and something bent downward in the hinder part. A more large portion of its superficies is joyned to the medullar substance of the Brain; but yet some part of it, being free from the cohesion with the Brain, shews it self apart, and makes that protuberance shewing it self in either lateral Ventricle. These bodies, if they should be dissected along through the middle, appear marked, with medullar streaks, as it were rays or beams; which sort of chamferings or streaks have a double aspect or tendency; to wit, some descend from the top of this body, as if they were tracts from the Brain into the oblong Marrow; and others ascend from the lower part, and meet the aforesaid, as if they were paths of the Spirits from the oblong Marrow into the Brain. And it is worth observation, that in the whole Head, besides there is no part found chamfered or streaked after the like manner.

If the use of these be inquired into, this presently occurs, that these bodies, placed between the Brain and its Appendix, are the great and common diverting places of either; to wit, which receive whatsoever impulses or forces of the Animal Spirits are sent from either, and communicate them presently to the other: Or that I may speak more plainly, this part is the common Sensory, to wit, as *Aristotle* saith, τὸ πρῶτον αἰσθητικόν, the first Sensory that receives the strokes of all sensible things, dilated from the Nerves of every Organ, and so causes the perception of every sense; which kind of strokes of sensible things, when from hence they are passed further into the Brain, presently Imagination succeeds the Sense: and further, these bodies, as they receive the forces of all the Senses, so also the first instincts of spontaneous local motions. To wit, as often as the Appetite discerns any thing to be done, presently the reciprocal tendencies of the Animal Spirits, that is, from the Brain into these parts, are disposed here to act the conceptions of motions coming from any part or member. For here, as in a most famous Mart, the animal Spirits, preparing for the performance of the thing willed, are directed into appropriate Nerves. That it is so, it appears, because every influence from the Brain into the nervous stock, and on the contrary, from this into that, and the mutual commerce of the animal Spirits, must of necessity pass through these bodies. Wherefore all the Nerves, also those which belong to the more inward Organs of the Senses, arise behind these chamfered bodies. For the Optick and smelling Nerves creep through the superficies of the Brain by a long passage and windings about, that they might be inserted below this part of the oblong Marrow.

For indeed, the Species of sensible things, received by those Nerves, might more immediately be carried to the middle of the Brain, unless that they ought first to be staid at this Sensory. Further, we may lawfully conjecture, that these parts perform the aforesaid office from their chamfered, and as it were beamy contexture: For as those chamfering with which these bodies are marked, (as we but now intimated) are of a double kind, to wit, some descending, which look from the Brain towards the oblong Marrow: and others ascending, which are carried distinctly from this towards that, it may be lawfully concluded, that in these carried upwards, the impressions of sensible things are perceived; and in those tending downwards are performed the Instincts of Motions.

Further, that these bodies, as was said, perform the offices of the first Sensory, besides the fabrick of their parts, and the Analogy to be collected thence of their use, it seems yet more certainly to appear from some Observations concerning these chamfered bodies, after what manner they are affected in Paralytick diseases. For as often as I have opened the bodies of those who dyed of a long Palsie, and most grievous resolution of the Nerves, I always found these bodies less firm than others in the Brain, discoloured like filth or dirt, and many chamferings obliterated. Further, in Whelps newly littered, that want their sight, and hardly perform the other faculties of motion and sense, these streaks or chamferings, being scarce wholly formed, appear only rude.

The chamfered Bodies, inclining one to another near their blunt and greater angles, are almost contiguous; but that the Trunk of the *Fornix* intervenes with its twofold Root: yet in that place where the two Roots of the *Fornix*, being sent straight down, are inserted into the callous body, a transverse medullary process, like a great Nerve, stretched from one chamfered body to the other, as it were joyns the same, and makes them to communicate one with the other. Certainly, this joyned together of the chamfered bodies is made, that their actions and passions may not be double: but though the species of the sensible object or conceptions of the motions to be performed, coming from the Brain or Sensory being double, are carried also double to the first Sensory; yet for as much as either substance or frame of this, communicates with the other, every impression coming this or that way, becomes still one and the same. For it may be observed, in the whole Head, that though almost all things are double, yet each of them communicate among themselves, either by a contiguity, or by processes sent forth. And so as by the duplication of it, care is taken against the absolute privation or defect of the act, so the joyning together of its duplicature provides against the empty or confuse multiplication of the same species.

After this manner, the chamfered bodies in Man and four-footed Beasts are constantly found of the same species or form, and in every one of them, figured after the same manner; and are as it were the Joynts that joyn the brain to the shanks of the oblong Marrow. But we have already shewn, that in Fowls and Fishes, whose brains being alike, differ from those of men and four-footed beasts, the thing is somewhat otherwise: For in Fowls the callous body is wanting to the brain; but what serves instead of it, is found in the oblong Marrow, to wit, two little Ventricles shew themselves nigh the chambers of the Optick Nerves, which are arched or chamber'd with a whitish substance, such as the callous body is in man or four-footed beasts. Then on the contrary, the chamfered bodies, or the parts which serve in their stead, in Fowls, are not a portion of the oblong Marrow after the usual manner, but are entered into the Brain it self. For near the fissure of the Brain, two Membranes being marked with medullary chamferings, both distinguish either Hemisphere of the Brain, and cover over its Ventricles. The streaks or rays of either Membrane descend, and being concentrated about the Basis of the Brain, go together into a medullary process, which is inserted on both sides to the oblong Marrow. So these parts, viz. the callous body, in which the animal Spirits are expanded, and the chamfered bodies, in which their passing to and fro is instituted, seem to be transposed in the head of Fowls. The reason whereof, (as I elsewhere hinted) unless I be deceived, is this: because these Animals are of less excellency in imagination and Memory than four-footed Beasts; yea also, for that the sense and motion of them are their chief Facul-

Faculties : therefore for the exercises of these to be performed with a greater expansion of Spirits, the callous body is transferred into the oblong Marrow, and in its place the chamfered bodies are removed into the Brain.

About the lower end of either chamfered body the smelling Nerves are inserted. For you may take notice, that the mammillary Processes, a little more obscure in man, but much more conspicuous in brute Animals, who are endued with a more remarkable sense of smelling, do pass into firm and plainly whitish bodies of Nerves, which being dilated or brought nigh the lateral turnings and windings of the Brain, are implanted into the oblong Marrow on either side about the lower angle of either Ventricle behind the chamfered bodies; yet so, that the Tube or Pipe of either Nerve may open into the Cavity of the Ventricle, as we before shewed. After this manner these Nerves are carried by a long journey from the fore-part of the Brain, that they may bring the sensible species to the chamfered body, as to the common Sensory, first and rather than to the Brain. But we shall speak of the smelling Nerves more particularly hereafter.

Where these chamfered Bodies end from either side, a marrowy substance succeeds, which being somewhat of a darkish colour going forward for some space, is distinguished by a peculiar bending forward from the other contiguous parts. This *Galen* (perhaps not improperly) calls the Chambers of the Optick Nerves; for in this place the Optick Nerves shewing themselves from the highest region of either side, being carried downward with a certain compass, are united about the Tunnel. Then being divided again, and carried a little further, enter the Skull, going straight forward to either Sensory. The growing together of these Nerves, and their being again separated, seems to be ordained for this end, that the visible species, received from either Eye, might appear still the same, and not double; for this conjunction of the twofold Organ frames the double image into one; which once united, when afterwards it is carried to either side of the common Sensory, for that it is on both sides alike, appears still the same. If at any time, through drunkenness, or a distortion of the Eyes, the object appears double, and two Lights upon a Table, it is because the image of the same thing is received after a different manner by one Eye than the other, for that reason the objects are represented like two distinct things. For that this Eye is distorted after one manner, and that after another, the same Species, coming to either Pupil by a diverse angle of incidence, appears diverse or double. There is another reason of the coalition of the Optick Nerves, to wit, that one Eye being hurt, all the visible Animal Spirits might be bestowed on the other. Further, for that these Nerves are carried with a long passage, their uniting helps to their mutual strength and support.

Whereas the Optick Nerves arise here from the oblong Marrow, all or its most intimate substance is not bestowed upon them; but these Nerves are inserted into the medullar Trunk, as branches of a Tree to the stock, that so they may receive by that means the influence of the Spirits, and by this way transmit the Species of visible Things. In the mean time, this more inward substance of the oblong Marrow is the common passage both to the Eyes and to the other nervous System arising more backward: through which, by the going and returning to and fro of the animal Spirits, the impulses of sensible things, and the instincts of Motions between the Brain and the other nervous parts, which depend upon it, are performed. Forasmuch as the smelling and seeing Nerves arise so near the chamfered bodies, the reason hence is plain, why odors or the objects of the sense of smelling so strike the Brain it self, and immediately affect it; also why there is so exceeding swift communication between Sight and Imagination.

Concerning the Optick Nerves in a Man, (which also in some measure is after the same manner in other living Creatures) we shall advertise you, that when they, after their uniting or mixing together, being presently again separated, do go out of the Skull, the sanguiferous Vessels going out of the Skull with them, and following either Nerve even to the Basis of the Eye, are knit into the Trunk of either. There is a noted shoot of the Artery destined to this office, carried from the anterior branches of the Carotides. Hence, as I suppose, a reason may be given, wherefore, when by drinking or more plentiful eating, a sleepiness is caused, presently a great heaviness, and as it were an oppression, is felt about the Eyes. For when the blood, very much boiling up, fills above measure the Vessels watering the Brain, and by distending them, obstructs the Pores of the Brain, those Nerves also from the blood in like manner boiling up within the Optick Vessels, are pressed together in their whole passage.

In Fowls and Fishes this chamber of the Optick Nerves, bunching out with a great bulk, is not much less than the Brain it self; for, as we but now intimated, what is instead of the callous body is placed here; and in this place the Animal Spirits seem to have their chief Mart or Empory in a most large medullar chamber, or the Sphere of their Expansion. And so, when from hence the Animal Spirits are derived from so full and plentiful a Store-house, it is for that reason Fowls are furnished with so curious an Eye, and with so highly perspicacious and acute a sight. And the same perhaps may hold concerning Fishes, if that we consider the sight in these is performed in a thicker Medium, and often double.

In some Animals, in the midst of these chambers of either Optick Nerve, the shanks of the oblong Marrow a little opening, leave a chink or aperture, which receiving the serosities coming from every region of the Brain and its Appendix, sends them through the Tunnel into the pituitary Glandula.

There is no need that we should discourse much here of the Tunnel and the pituitary Glandula, because, already speaking of the Ventricles of the Brain, or the empty space left within its plicature, we fell occasionally on the consideration of both these: where we shewed, that the serous humors, which were

went to be heaped together within many places of the Brain and of its Appendix, do all slide down on every side from each angle and recess of it into the steep opening of the Tunnel; and so there is a necessity that they should be poured out by it into the pituitary Glandula. Further, it is manifest, that this Glandula, in some Animals, is charged with a double office; to wit, as it receives the serosities sent from above from the Brain, so also it separates the humors from the blood brought to the same from the wonderful Net by the Arteries, and prepossessing them, imbibes them before their ingress to the Brain. Wherefore this part is furnished with a substance of a double kind, viz. one reddish, more thin, and interwoven with Blood-carrying Vessels, which constitutes either side of it; and the other more white placed in the middle, to which the Tunnel is inserted.

But having shewn, that this Glandula receives the humors so brought by a double Tribute, we did diligently inquire concerning the ways and means whereby they are at length carried away from thence, and as it appears by an Experiment, that there is a passage open from this Glandula into the Vessels lying underneath the bone, and from thence into the Jugular Veins, we affirmed, that 'twas most likely, that the humors to be carried away from this Glandula, (after the manner of others) may be reduced at last into the bloody mass. I shall not add any more concerning these things, but proceed to the other parts of the oblong Marrow. But that, what hath been said, concerning the shanks of the oblong Marrow, and their tops, viz. the chamfered bodies, may be the better understood, it will seem to the purpose that we represent the Images of all these in the following Figure.

The Eighth Figure.

Represents the oblong Marrow taken out of the Head of a Sheep with the Brain cut off and removed, and with the Cerebel and one streaked Body cut in two in the middle, and other things chiefly belonging to the medullar Trunk.

- AA. The chamfered Body cut in two in the midst, that its marrowy chamferings may appear.
- B. The other, chamfered Body whole covered with the Choroidal Infolding with the extreme portion of the callous Body CC. sticking to the same.
- CC. The brim or extremity of the callous Body cleaving to the chamfered Body.
- D. The Basis of the Fornix.
- E. The right wing of the Choroidal Infolding.
- F. The passage of the Veins being stretched out from the fourth bosom, which being presently forked, constitutes the veinous portion of either wing of the Choroidal Infolding; under the beginning of this passage, very much beset with Fibres and sanguiferous Vessels, the Pineal Glandula lyes hid.
- G. The hole or chink leading to the Tunnel.
- HH. The chambers of the Optick Nerves.
- II. The medullary processes, or the ways of passage which lead from the medullar stock into the orbicular Protuberances.
- KK. The Buttock-form orbicular Protuberances.
- LL. The lesser Protuberances called Testes.
- M. The meeting together of the Processes ascending obliquely from the Testes into the Cerebel.
- N. The hole of the lower Ventricle lying under the orbicular Protuberances.
- OO. The pathetick Nerves of the Eyes.
- PP. The medullary Processes stretched out from the Testes into the Cerebel.
- QQ. Other medullary Processes, which being sent from the Cerebel towards the oblong Marrow, compass about its stock, and constitute the annular or ringy Protuberance.
- RR. The lowest or third Processes of the Cerebel, which being inserted to the medullar Trunk, become additional cords or strings of it.
- SS. The medullar Ramifications or Branchings of the Cerebel.
- TT. The middle marrow of either Cerebel in which its three medullary Processes, constituting either little foot of it, grow together.
- V. The Ditch constituting the fourth Ventricle in the medullar Trunk.
- X. The extremity of the oblong Marrow about to end in the Spinal.

CHAP. XIV.

Of the Uses of the Pineal Glandula and the Choroeidal Infolding; also of the orbicular Prominences which are commonly called Nates and Testes; and other Parts which seem to be dependences of them.

Below the Chambers of the Optick Nerves in a common Valley which lyes between the tops of these and the Buttock-form Prominences, is placed the Pineal Glandula or Kernel in form of a Pine-apple, called also *Conarium*; this is not only found in Man and four-footed Beasts, but Fowls and Fishes also are endued with the same. Wherefore, although from hence it may be concluded, that this is of necessary use; yet we can scarce believe this to be the seat of the Soul, or its chief Faculties do arise from it; because Animals, which seem to be almost quite destitute of Imagination, Memory, and other Superior Powers of the Soul, have this Glandula or Kernel large and fair enough.

It is observed in all Animals of every kind and form, that to this Glandula, always placed nigh the holes or passages, open to the Tunnel, the Choroeidal Infolding is continually joyned; yea this infolding (seeming to hang from the Pineal Kernel sustaining its middle Process, as it were by a nail or halp, from thence) is divided into two wings stretching out on either side upon the shanks of the oblong marrow. Wherefore we may justly suspect, that this Glandula is chiefly made for the sake of this infolding; and that the office of it is no other than of other Kernels, which are placed nigh the concourse of the sanguiferous Vessels: to wit, that it may receive and retain within it the serous humors deposited from the arterious blood, till the Veins being emptied, may sup them back, or the Lymphæducts (if there be any there) may convey them outwardly. For it is observed, that the Choroeidal infolding is beset with very many lesser Glandula's or Kernels, and every where interwoven with them, which imbibe the Serum secreted from the blood, in the smaller Vessels; therefore for this very same office, where all the Vessels concur, this Kernel is placed, of a bigger bulk, that it might be able to receive and contain the serosities there plentifully deposited. Moreover, it is of no small moment, that this Glandula sustains and keeps duly stretched out the *Choroeidal* infolding otherwise hanging loose, and apt to fall down into it self, or at least to slide out of its proper place. Wherefore I have often taken notice in the Dropsie of the Brain, that this Glandula being loosened at the roots by too much moisture, and often broken off, and removed from its place, the *Choroeidal* infolding hath slid together from its proper expansion, and slip'd down lower, and also suffered its Vessels to be folded together disorderly.

From these things thus premised concerning the Pineal Glandula, it will not be difficult to assign also the use of the *Choroeidal* infolding: Concerning which there will be little need to refer that Opinion of the common sort, which asserts, That the animal Spirits, to be bestowed upon the whole Brain, are begot in this infolding: because the Vessels of this instil nothing to the substance of the Brain or its Appendix, for that they are no where inserted to it; but it was before shewn, that the Ventricles of the Brain, or the Cavity in which these same Vessels are hung, do not at all contain the Spirits; which further appears more plain, because in Cephalick diseases those Ventricles are filled with water, and the continuity of the infolding is dissolved by too much moisture, when in the mean time the sick are indifferently strong in the exercise of the animal Faculties.

But indeed we suppose, that this infolding serves for a twofold office: *viz.* First, that the more watry part of the blood, destinated for the Brain, might be sent away into its Vessels, to the end, that the remaining portion of the bloody *Latex* might become more pure and free from dregs to be distilled forth into Spirits; even as is wont to be done in a Chymical Distillation, to wit, when there is a peculiar Receiver fitted for the receiving of the Phlegm by it self, more sincere, pure, and subtil Spirits are instilled into the other more noted Receiver. The more watry blood entring the arterious Vessels of this infolding, being carried from them into the Veins, is remanded back towards the Heart. In the mean time, lest the Serum, too much redounding, and boiling up in these Vessels, might hinder circulation, its superfluities are received for some time both by the lesser Glandula's thickly inserted, and also by the pineal Kernel.

The other and no less noted use of this Infolding, is to conserve the heat of the blood boiling within the complications of the Vessels, and as it were circulating about, being excited as from a fire-place within the infolding of the Brain. For though the *Pia Mater* need not implant thick shoots of Vessels in the callous Body and inward Marrows of the Brain, for that they are rather dedicated to the Exercise than to the Generation of the animal Spirits; yet that the heat requisite for the circulation of the Spirit, might be kept constantly in that place, this infolding is hung upon the whole neighbourhood. For as the blood, aggested or heaped together within the Cavities of the Bosoms, is instead of an

hot Bath, whereby the animal Spirits are distilled plentifully into the outmost and cortical part of the brain; so the blood contained within the small Vessels of this infolding, seems to be in the place of a lesser and more temperate Bath, whereby the same Spirits might be sicly circulated in the more inward and medullar substance.

Lastly, Another reason may also be given, why the Chorocidal infolding is found always within the Ventricles or Cavity of the Brain, made by its infolding, and after what manner soever figur'd; to wit, that another sort of commodity might result from thence; that when the Vessels of that infolding, carrying too watry blood, lay aside more Serum than the Glandula's are able to receive or contain, whas is superfluous might slide down opportunely into the underlying Cavity, as into a Sink. Wherefore the *Pineal Glandula*, though set in a more eminent place, is however placed always near the hole or passage that lyes open towards the Tunnel in every Brain.

Next to the Pineal Kernel are found in the upper superficies of the oblong Marrow certain noted Prominences, which are commonly called *Nates* and *Testes*. These being placed naar together, do constitute as it were four Mole-hills, which yet are joyned one to another by certain processes. Beneath these Mole-hills, or rather between the joyning of them and the runk of the oblong Marrow, placed underneath, a narrow and long Cavity or Den is left, which by some Anatomists is called the fourth Ventricle; but according to others later, who place the fourth Ventricle under the Cerebel, this Cavity is affirmed to be a passage to it.

The hinder extremity of this Den ends nigh the beginning of the fourth Ventricle; the more fore-extremity of it opens before the former Mole-hills or little bulkings out, called *Nates*. From the midst of this Cavity or narrow Den a passage goes straight to the Tunnel. It is very much controverted among Anatomists concerning the site of these parts, and of their dependency on one another, and of other parts, and of their use: Concerning which this is first to be noted, as we hinted above, that these four Protuberances are far greater in some brute Animals than in a Man, as in a Sheep, Calf, Goat, and the like; also in a sound dry, and old Head they are more conspicuous, and their processes, joynings and habitudes may be more easily noted than in a younger, moist, or otherwile sickly brain. Indeed the use of these (unless my conjecture deceives me) seems far more noble, than that they should deserve those vile names of *Nates* and *Testes*, Buttocks and Testicles.

Notwithstanding, to what office these parts were designed, neither have the ancient Anatomists delivered, nor will it, by the help of Reason, be easie to guess for certain. We have already shewn, that these aforesaid Prominences ought not to be taken for the two shanks either of the Brain or Cerebel bending back one towards another, and so growing together into the oblong Marrow. For although from this supposition a very neat Hypothesis may be made for the oeconomy of the animal Function, to wit, by affirming that these double shanks, on either side, were so many distinct ways of passage through which the animal Spirits, for the performing of motions, flowed from the Brain and Cerebel into the oblong Marrow, and returned thence from this into those for the performing the acts of the Senses: yet from our Method of Dissecting it plainly appears, that the brain is not fixed to the oblong Marrow nigh this place, but far above it; so that indeed the anterior Prominences, unless mediately only, viz. by the chamfered bodies, receive not any portion of the medullar stock, or any influence from the brain, nor can have any dependency from it. Besides, if the Protuberances called *Nates* were shanks of the brain, why should the same be in man, (he having got the greatest brain, the least) or at least lesser than in most other living Creatures? Then between the Prominences called *Testes* and the Cerebel, although there happens a certain communication; yet it seems that there lyes open a passage from those little lumps into the Cerebel, and not from this, through them into the oblong Marrow. For out of these aforesaid Prominences a medullar Process ascends obliquely one either side into the Cerebel, by whose passage the animal Spirits, tending from one stage to the other, cause a mutual commerce between those parts and the Cerebel: But indeed the Processes which lead from the Cerebel into the oblong Marrow, and carry to it its influences, being distinct from the former, stand somewhat lower, as shall be more clearly shewn hereafter, when we shall speak of the Cerebel.

But in the mean time, concerning the offices and uses to which the aforesaid Protuberances serve, we shall make this conjecture. The animal Spirits perpetually flow out and leap back again from the fountain the brain into the oblong marrow, so that there may be had a constant commerce between the brain and many organs of sense and spontaneous motion: from which those parts are entertained which perform their actions, not at the beck of the Appetite, but either by the instinct of Nature, or the blind impulse of the Passions; for such receive wholly their influences from the Cerebel, as afterwards shall be more fully shewed. Whilst therefore the Spirits, flowing from the brain, abound in the oblong marrow, it is fit that some of them should be carried from thence into the Cerebel: (for what uses this ought to be done, shall be told by and by) wherefore from either side of the oblong marrow a Protuberance grows forth, into which indeed the Spirits designed for the Cerebel, may go apart from the common passage of the oblong marrow; and these Prominences are the former, which are commonly called *Nates*, and as we have said, are far greater in most brute Animals than in Man (the reason of which shall be declared anon.) The other hinder Protuberances, commonly called *Testes*, grow to these former, and are only certain Epiphyfes or Excrescences of them, as it were the heads of the medullary Processes, which are from thence carried by an oblique ascent into the Cerebel; for when the animal Spirits ascend

ascend from the former Prominences into the Cerebel, they enter these latter first, as it were the more large beginnings or entrances of their passage, from whence they go forward by the passage of the medullar Processes into the Cerebel.

Besides we may take notice, that when the animal Spirits are carried out of the oblong marrow into the greater natiform Prominences to be derived towards the Cerebel, they, according to their custom, (as often as they tend towards the common Sensory from a double Organ of any Faculty) ought to be confounded and mingled together before they enter the Cerebel: wherefore both the first Prominences, and also the second growing to them are joyned together with certain Processes like wings reaching one another; which connexion indeed of them, because it ought to be distinguished every where from the medullar Trunk lying under it, hence, from the separation or empty space that comes between the oblong marrow and the growing together of the Prominences, that cavity arises, which is by some called the fourth Ventricle, and by others the passage to it.

If it be yet farther inquired, to what end the animal Spirits are carried by this by-passage from the common passage of the oblong marrow into the Cerebel, and thence back again; I say, that this is done for a twofold respect, viz. both that the Passions or Affections of the sensitive Soul, begun from the brain, may be transmitted to the *Præcordia* and *Viscera*; then secondly, that the natural Instincts, excited in the *Præcordia* and *Viscera*, might be communicated to the brain. These reciprocal commerces which are had between the Brain and the Organs of involuntary Functions, ought to be instituted or performed by this private passage, lest otherwise the exercises of these involuntary Faculties should very much disturb the acts of the outward Senses, or the intentions of spontaneous motions.

As to the first, it is observed, that by every passion of the sensitive Soul, as from Anger, Sadness, Pleasure, and other Affections, the *Præcordia* are disturbed, whether we will or no; which variously dilate or constrain themselves, and so stir up in the blood divers fluctuations. Moreover, from this kind of force of the Passions the countenance or the aspects of the Face are wont to be altered and distorted after various ways. The reason of all these seems to be, because when the animal Spirits, existing within the Brain, are moved according to the Idea of the conceived Passion, the other Spirits also flowing within these diverting places, being in like manner moved, affect the Cerebel, and that coming between, the original of the Nerves, serving to the *Præcordia*, *Viscera*, and Muscles of the Face, and so the parts to which those Nerves are distributed, are also stirred up or provoked into motions answerable to the same passion.

But the afore said Prominences and their dependences serve no less also for the conveying of the impressions of natural Instincts to the Brain, that from thence the Appetite and local motions might presently be retorted; by which all the exigencies or wants perceived by the *Præcordia* or *Viscera* might be supplied. When in a young one newly born the stomach cries out for hunger, the Instinct of this is carried by the passage of the Nerves to the Cerebel, and from thence by the medullar Processes to these Protuberances; and the Spirits there inhabiting, form the Idea of the Impression, and carry it to the brain, wherein presently, without any previous knowledge or experience, such kind of conceptions of the Soul are stirred up, that every little living Creature presently seeks out the Mothers breasts and sucks.

But it may be objected, it does not seem of necessity we should suppose these kind of acts of the Passions and Instincts to be made apart in this by-place; for why are not the commerces of the animal Spirits ordained by the influence from the Brain into the Nerves leading to the *Præcordia*, and so back again through the common passage of the oblong Marrow? But to that it may be readily answered, That this reciprocal motion of the Spirits ought to be made through the middle region of the Cerebel, from one stage to another for the exercise of these Faculties: And therefore, (since that all manner of communication between the Brain and Cerebel is performed by these Prominences) there should also be had a passage by the same way between this and the Organs of the Functions merely natural. Besides, if the rage or furious motions of the Passions and Instincts should be carried in the same path in which the forces of sensible things are carried, their acts might be greatly confounded by the mutual meeting or gathering together of the animal Spirits. But this kind of Hypothesis concerning the Acts and Progress of the Passions and natural Instincts, shall be made more clear afterwards, when we design the Actions and Uses of the Cerebel, and of the other parts, which in like manner seem to be destinated to the same offices with these Protuberances.

In the mean time, what we have affirmed, that the latter Prominences are only Additional or Excrecences of the former, will clearly appear to any one beholding them. But this, as we have already hinted, is seen without Controversie in the brains of a Calf, a Sheep, and some other four-footed beasts; where, when the *Nates* are signally great, the *Testes* grow to the same in a very small bulk. Further, that the medullary Processes lead from these into the Cerebel, and convey the animal Spirits by this by-path, is so manifest, that none who hath carefully beheld these parts, can be able any further to hesitate or be doubtful of it. For indeed the little hairs or fibres wherewith these processes, ascending into the Cerebel, are marked, are otherwise figured and placed than those which are beheld in the neighbouring process descending from the Cerebel towards the oblong Marrow.

Moreover, either pair of Prominences do not only communicate among themselves mutually by their stretched out wings, but also another medullar Process, going cross-wise, knits together the aforesaid Processes stretched out from thence into the Cerebel; and from this joyning together of them two small Nerves are produced, which bending down on either side, and being carried forward, enter the *Dura Mater*, and so go straight through it, till having reached to the moving Nerves of the Eyes, they go forth of the Skull at the same hole with them, going forward, straight to the Throchlear Muscle of the Eye. Concerning these little Nerves it is observed, that when many others proceed from the sides or the Basis of the oblong Marrow, these arise from the aforesaid Prominences in the bunching forth at the top. The reason of which, if I be not mistaken is this: We have affirmed, that these Prominences do receive and communicate to the Brain the natural instinct delivered from the Heart and Bowels to the Cerebel; and on the other side, or back again, do transfer towards the *Præcordia*, by the mediation of the Cerebel, the forces of the Passions or Affections received from the Brain; but in either action the motion of the Eyes is affected with a certain manifest Sympathy. For if pain, want, or any other signal trouble afflicts the *Viscera* or the *Præcordia*, a dejected and cast down aspect of the Eyes will declare the sense of its trouble: when on the contrary, in Joy, or any pleasant Affection of the *Præcordia* or *Viscera*, the Eyes are made lively and sparkle again. In like manner, the Eyes do so clearly shew the Affections of the Mind, as Sadness, Anger, Hatred, Love, and other perturbations, that those who are affected, though they should dissemble, cannot hide the feeling and intimate conceptions of the mind. Without doubt these so happen, because the animal Spirits, tending this way and that way in this diverting place between the Brain and the *Præcordia*, do at once strike those Nerves as the strings of a Harp. Wherefore from this kind of conjecture which we have made concerning the use of these Nerves, we have called them Pathetical, although indeed other Nerves also may deserve this name.

There yet remains for us to take notice of the aforesaid Prominences, that either of these pairs, and the Processes hanging on them, are distinguished from the Trunk of the oblong Marrow lying under by the Cavity between them; so that this Cavity or *Ventricle* seems to exist only secondarily, because the empty space between the aforesaid bodies, placed above and beneath, separating the same one from another, ought to come between. But this Cavity seeming to result so by accident, hath a very signal use; for in the middle of its passage a sloping aperture reaches towards the Tunnel, through which the humors sliding into either of its holes, one made more forward, the other more backward, are sent out. The more forward hole is placed, between the chambers of the Optick Nerves, a little before the Pineal Glandula, into which the serous heap being laid up nigh to the confines of the oblong Marrow, slides by degrees: but the other hole is opened more backward into the fourth *Ventricle* which is planted under the Cerebel; which hole is covered with a thin Membrane, which girding about its mouth and that of the Cerebel, provides lest the humors, derived from the fourth Ventricle, or the confines of the Cerebel, should fall down any other way than into that hole; but if at any time that little hole be broken asunder by a deluge of the Serum, the watry *Latex* sliding down upon the Basis of the oblong Marrow, overwhelms the origins of the Nerves, and so brings Convulsive distempers and meltings, and not seldom deadly, of the vital Spirits, as I have observed in the bodies of many dying of Cephalick Diseases.

CHAP. XV.

Of the Uses of the Cerebel, and some of its Parts and Processes.

HAVING hitherto continued the former Tract of the oblong Marrow, which as it were the Kings High-way, leads from the Brain, as the Metropolis, into many Provinces of the nervous stock, by private recesses and cross-ways; it follows now that we view the other City of the animal Kingdom. The situation of this being remote enough from the former, its kind of structure is also different from it: yea it seems that there are granted to this, as to a free and municipal City, certain Privileges and a peculiar Jurisdiction.

The Cerebel is placed a little below the orbicular Prominences in the hinder part of the Head; where growing to the Trunk of the oblong Marrow by a double little foot, it appears almost of a Spherical figure. Its superior gibbosity coheres towards the superficies to the border of the Brain by the intervention of the *Pia Mater*; but nevertheless it is intimately united to it, nor is there any immediate commerce between this or that or their parts. There hath been spoken enough already of the figure and situation of the Cerebel, and of its various Processes, and how it is fastned to the oblong Marrow; it now remains that we proceed to design or draw out the offices and uses of it, and its several parts. Where in the first place shall be inquired into, what kind of office the Cerebel is endued with in the animal œconomy; then when we shall descend to particulars, there are more things worthy to be noted, which will offer themselves

selves to our consideration : viz. first the infoldings of the Vessels covering the whole compass of the Cerebel, and especially its hinder part, with the heap of Kernels : secondly, its folds and lappets ordained with a certain and determinate series, and almost after a like manner in all : thirdly, the double substance of the folds, viz. cortical and marrowy : and the concentrating of all the medullary tracts in two large Marrows or middests : fourthly, either little foot or pedestal of the Cerebel made out of those two middle Marrows : and in either pedestal three distinct medullar Processes to be found : fifthly, the annular Protuberance made by a process of the Cerebel descending into the medullar Trunk : sixthly, some Nerves, which arising immediately from this Protuberance and other Nerves in the neighbourhood, which being designed for the involuntary Function, receive the influences of the animal Spirits from the Cerebel : Lastly, the Ventricle or Cavity lying under the Cerebel ought to be considered.

1. As to the office or use of the Cerebel in general : nothing of it occurs, spoken by the Ancients, worthy its fabrick, or agreeable to its structure. Some affirm this to be another Brain, and to perform the same actions with it : but if any one should have a soft and foolish Brain, I greatly doubt, if he should become wise, though he should obtain perhaps a more hard and solid Cerebel. Others place the Memory in this part, supposing the Cerebel to be as it were a Chest or Box, wherein the Ideas or Images of things, before laid up, are kept apart from the incourse of fresh Species. But it is far more probable, that this faculty resides in the cortical Spires of the Brain, as we have elsewhere shewn. For as often as we endeavour to remember objects long since past, we rub the Temples and the fore-part of the Head, we erect the Brain, and stir up or awaken the Spirits dwelling in that place, as if endeavouring to find out something lurking there ; in the mean time, there is perceived nothing of endeavour or striving motion in the hinder part of the Head. Besides, we have shewn, that the Phantasie and Imagination are performed in the Brain ; but the Memory depends so upon the Imagination, that it seems to be only a reflected or inverse act of this : wherefore that it should be placed with it in the same Cloister, to wit, in the Brain, is but necessary ; for it plainly appears, that there is no immediate commerce between the Brain and the Cerebel.

When some time past I diligently and seriously meditated on the office of the Cerebel, and revolved in my mind several things concerning it, at length, from the Analogy and frequent Ratiocination, this (as I think) true and genuine use of it occurred ; to wit, that the Cerebel is a peculiar Fountain of Animal spirits designed for some works, and wholly distinct from the Brain. Within the Brain, Imagination, Memory, Discourse, and other more superior Acts of the animal Function are performed ; besides, the animal Spirits flow also from it into the nervous stock, by which all the spontaneous motions, to wit, of which we are knowing and will, are performed. But the office of the Cerebel seems to be for the animal Spirits to supply some Nerves ; by which involuntary actions (such as are the beating of the Heart, easie Respiration, the Concoction of the Aliment, the protrusion of the Chyle, and many others) which are made after a constant manner unknown to us, or whether we will or no, are performed. As often as we go about voluntary motion, we seem as it were to perceive within us the Spirits residing within the fore-part of the Head to be stirred up to action, or an influx. But the Spirits inhabiting the Cerebel perform unperceivedly and silently their works of Nature without our knowledge or care. Wherefore whilst the Brain is garnished as it were with uncertain Meanders and cranklings turnings and windings about, the compass of this is furnished with folds and lappets disposed in an orderly series ; in the spaces of which, as in designed Orbs and Tracts, the Animal Spirits are expanded according to the Rule and Method naturally impressed on them. For indeed those in the Cerebel, as it were in a certain artificial Machine or Clock, seem orderly disposed after that manner within certain little places and boundaries, that they may flow out orderly of their own accord one series after another without any driver, which may govern or moderate their motions. Wherefore forasmuch as some Nerves perform some kind of motions according to the instincts and wants of Nature, without consulting the government of the will or appetite within the Brain, why may it not be imagined, that the influence of the Spirits is derived wholly from the Cerebel for the performing of these ? For it seems inconvenient, that for these offices which should be performed without any tumult or perturbation, the Spirits should be called out of the Brain, which are continually driven into fluctuations as it were with the winds of Passions and Cogitations.

As I only imagined of the use of the Cerebel after this manner, I was led to it at length by a certain thread of Ratiocination ; to which afterwards happened an Anatomical inspection, which plainly confirmed me in this Opinion. For in the frequent Dissection of the Heads of several sorts of Animals certain Observations did occur, which seemed to put this matter out of all doubt. For I first observed, the pairs of Nerves, which did serve to the Functions, wont to be performed by the Instinct of Nature, or the force of the Passions, rather than by the beck of the will, so immediately to depend on the Cerebel, that from thence only the influence of the Animal Spirits seems to be derived into their origins or beginnings. By what means the Nerves arising from the Cerebel, or receiving from it the provision of the animal Spirits, do perform only involuntary actions, shall be declared hereafter ; in the mean time, for the confirmation of this Opinion, we have in readiness another Reason of no less moment.

Therefore secondly, we took notice, that not only the conformation or make of the Cerebel was ordained after a certain and peculiar manner, that is, that its frame or bulk was couched together with folds or little circles, disposed in a certain distinct series, and apt method, and proportionate within themselves, as hath been said; whence it may be argued, that the Spirits arising from hence, and flowing outwardly, are employed or bestowed on some certain works determinate to one thing. But further it is observed, that in all Animals, although they differ in form and kind, yet the figure of the Cerebel is always very like or wholly the same. The Brain and oblong Marrow are figured in many after a divers manner; for as we have shewed before, there is some difference of these parts found in man and four-footed beasts; but between either of these, and Fowls and Fishes, there is a notable difference as to these parts. Notwithstanding in all these the Cerebel, furnished wholly with the same lappets or little circles alike infolded one in another, is marked with the same form and proportion; which certainly is a sign that the animal Spirits in this work-house are begotten and dispensed, as it were by a certain dimension, for certain necessary offices, which are performed in all after the same manner; and which cannot be any other than the motions and actions of the *Viscera* and *Præcordia*. As to the other Faculties, of which sort are Imagination, Memory, Appetite, yea local motions and sense are exercised after one manner in those living Creatures, and after another manner in others; wherefore their brains are formed after a divers manner. But the motions of the Heart and Respiration in all endued with an hot blood, are performed after a like manner, that is, with a perpetual vicissitude of *Systoles* and *Diastoles*. Besides, another office is to be assigned to the Cerebel, and different from what is convenient or agreeable to the Brain; because where the folds and turnings are wanting in the Brain, they are constantly found in the Cerebel. Besides these reasons drawn from Anatomy, the Pathology of the humane Body affords many others, which confirm the afore said office of the Cerebel. For it oftentimes happens that cruel and horrid Symptoms infect the *Præcordia* and the region of the middle or lowest Belly; whilst in the mean time, the morbidick cause lyes in the Cerebel, or nigh its confines. I have known sometimes men labouring only in appearance with a Dyscrasie of the hinder part of the Head, who complained of frequent Swooning and repeated meltings of the Spirits or Deliquiums, as if they were just dying: in whom notwithstanding nothing more could be detected of the morbidick cause or its seat, but that the Patient perceived a great heaviness and pain in the hinder part of the Head, and that upon any sudden motion or bending back of the Head, they were ready to dye. In truth, the Symptoms which are wont to be raised up in the distemper called the *Incubus* or Night-mare, viz. loss of speech, and a mighty weight or load that seems to lye upon the breast, proceed altogether from the morbidick matter fixed in the confines of the Cerebel, and obstructing the passages of the Spirits destinated for the *Præcordia*. But indeed this Hypothesis of the office of the Cerebel shall be more illustrated and confirmed from the uses of its several parts, being rightly designed or drawn forth.

As to the parts and accidents of the Cerebel, 1. we take notice, that the infoldings of the Vessels every where cloath the Cerebel no less than the Brain, also that the ridges and furrows of its folds intimately hide or cover it, which certainly is a sign that the animal Spirits are begotten in this other work-house of them from the watering blood, and instilled into its substance: which thing also more clearly appears, because the Arteries and Veins are not only variously complicated in the superficies of the Cerebel, but both of them in like manner as in the Brain, send forth frequent shoots into its more inward substance; wherefore whilst the most subtil and spirituous part of the blood being carried through long windings about, and as it were serpentine chanel of the Vessels, and so sublimed into Spirits is received within; the bloody part is carried away by the shoots of the Veins sent also deeply down. Further, even as the more watry portion of the blood, destinated for the Brain, runs into the *Choroicidal* infoldings (whereby it may there lay aside its unprofitable Phlegm into the Glandula's) so for the sake of separating the Phlegm an heap of Glandula's, with the foldings of the Vessels, as it were a Receptacle fitted for this business, is placed in the hinder Region of the Cerebel.

2. From the blood, after this manner cleared from Phlegm, and made subtil by a long circulation, very pure and spirituous liquor is instilled into the cortical substance of the Cerebel, which is presently exalted by the Ferment there placed into animal Spirits. For indeed we have affirmed, that the Spirits are procreated only in the cortical part of the Cerebel, as in that of the Brain: wherefore, because this kind of Cortex is wanting to the oblong and spinal Marrow, we think these parts do serve only for the exercise of the animal Spirits, and not for their production.

3. The Spirits every where produced within the cortical or exterior compass of the Cerebel, in which they are presently prepared for the work of the animal Function, are derived from all the folds into the medullar tract, and thence into two ample middle Marrows; where they keep full as it were the fountain or Spring, and there like the bubbling up of waters, are circulated within with a perpetual turning and from thence they continually stream forth into the parts of the nervous System proper to themselves.

4. As to the ways of Emanation it is observed, that the two middle Marrows of the Cerebel pass as it were into two pedestals or little feet, by which they are fastned to the trunk of the oblong Marrow; and for that in either little foot of it three distinct medullar Processes are found, all these, or at least two of them, are as it were so many paths whereby the animal Spirits stream forth from their fountain and flow back again.

5. The first of these Processes ascends into the Cerebel from the orbicular Prominences, the use of this we have already declared; to wit, that there may be a certain passage between these Prominences and the Cerebel, in which, whilst the animal Spirits, as in a by-path, move this way and that way, to and fro, they may transmit both the force of the Passions from the Brain by the interposition of the Cerebel to the *Præcordia*, and convey also the natural Instincts delivered to the Cerebel from the *Præcordia* and *Viscera* towards the Brain. But the second Process descending straight from the Cerebel, embraces the medullar Trunk, and so going round about it, constitutes the annular or ringy Protuberance, out of which the fifth, sixth and seventh pair of Nerves take their originals; so indeed, that this Protuberance seems to be the Ware-house or Store-house of the Spirits flowing from the Cerebel, from which they may influence and be derived into the opposite passages of the Nerves. Lastly, the third process of either little foot, descending from the Cerebel into the oblong Marrow, is inserted into its Trunk over against where the eighth pair of Nerves have their Original: so that it should seem very likely, the provision of the Spirits destined for this Nerve is derived also by this way from the Cerebel; then what Spirits superabound, remaining longer than this Nerve requires, they sliding down into the common belly or chanel of the oblong and spinal Marrow, increase the plenty of those parts. For this same end the smooth and pyramidal bodies are reached out of the annular Protuberance above the oblong Marrow towards the Spine, to wit, that by the passage of those Processes the Spirits of that provision or stock superabounding, might flow out partly into the beginning of the eighth pair, and partly into the common tract of the medullar Trunk.

Thus much we have spoken briefly and summarily of the Uses of the Cerebel, and of its parts and Processes. But that it may be the better understood, and also that this new thought of Theory concerning the involuntary Function of the animal Regiment, may be more clearly illustrated, we shall here give you a more particular Order or Method of the Spirits brought forth in the Cerebel, and as it were take a view of, or muster their Arms or Forces. Further, it will seem to the purpose, that we should design or draw forth more openly the abundance or plenty of the Nerves receiving their gifts from this Fountain of the Spirits concerning the Acts to be performed only of the involuntary Function.

C H A P. XVI.

Of the various Order and diverse manner of Exercise of the Spirits produced in the Cerebel for the Acts of the involuntary Function.

AFTER having shewn, that the office of the Cerebel is to procreate animal Spirits apart from the Spirits begotten in the Brain, and to dispense them into the Nerves, the Executors of the involuntary Actions and Passions; there yet remains to be unfolded by what manner of oeconomy or government the Spirits inhabiting the Cerebel and made free, are busied both by an intestine Circulation, within their proper dwelling places, and are wont to be expanded and flow out with an exterior irradiation for the necessities and wants of other parts: then these things being shewn, we shall design more particularly the Uses and Offices of the Nerves, and of some other Processes doing service to this Government.

As to the first, as the Cerebel is the other primary Root of the sensitive Soul, or the Fountain from whence the animal Spirits, being diffused through the whole substance of it and its Appendix, are continued still under the same systasis and radiant Contexture, it is to be noted, that this radiation of the Spirits from the Cerebel doth flow after another manner than the other from the Brain: because this being left to it self, is bestowed by a constant efflux or flowing out on the Organs both of the vital Function and the merely natural, and its expences by an equal continual provision of Spirits, are made up again from the bloody mass continually intilled in. But on the contrary, the Spirits flow out from the Brain, neither by such a continual course without intermission and by little and little, nor are sustained by a perpetual provision and sliding in by degrees; but both the loss of them, and their refection, are uncertain, unequal, and variously interrupted. For neither are the spontaneous Acts of the Function it self, to which they serve, performed after any constant or always the same manner; but according to exterior accidents and occasions we put them forth by heaps, and with a certain force sometimes, and again sometimes we suffer them to be wholly intermitted and unemployed. Therefore the Spirits also are in like manner supplied with an uncertain measure; to wit, they are intilled in sleep plentifully and more copiously, but waking more sparingly and with hard labour, or scarce not at all. Yea the involuntary portion it self of the sensitive soul (which flows from the Cerebel) for that it hath a near commerce and affinity (as was already said) with the other radicated in the Brain, therefore it is wont to be much disturbed in the performing its

its office equally and peaceably, and being variously affected and agitated by the impulses sent here and there, or from this place and that, it is compelled, sometimes to contract, sometimes to extend its *Synstasis* in the whole or in part, and so is rendered obnoxious to several Passions, and ordinarily instigated to the performing irregular and disorderly actions.

But indeed the contexture of the Spirits, or the part of the Soul irradiating the Cerebel and its Appendix, is both affected with a certain sense, and is urged into motions appropriate to it self, though diverse. The sense or Sympathy belonging to this, if it be terminated within the confines of the Cerebel, is always private, nor goes any farther forward to the Brain with a more strong undulation or wavering; and because it is performed the living Creature knowing nothing of it, unless by the effect it cannot be known, for that it excites a peculiar motion. But such an affection of the Cerebel is implanted in it, that by every new disposition of the *Præcordia* and *Viscera* communicated to this from beneath, also from every violent passion excited within the *Forum* of the Brain, and so sent from above, a certain impression is carried to the inhabitants of the Cerebel: by which indeed they are disposed into various ordinations for the performing these or those motions respectively.

For examples sake, so long as the tranquil region of the Cerebel, like a serene and fair Heaven, is free from all perturbation, the Spirits its inhabitants, being poured out with a pleasing sense, or as it were a certain complacency, flow within their proper habitations, both with a gentle circulation, and also with an equal flowing out enter the beginnings of the Nerves serving to the Functions both vital and natural: by which indeed easie Respiration, the Pulse, Chylification, and other offices of the same nature, are performed peaceably. But if that any trouble or molestation happen outwardly, to any one, from whence an impression of it is communicated to the Cerebel, presently a troublesome sense being stirred up there, it disturbs the animal Spirits in the Fountain it self, and so is wont to excite irregular motions in the Organs of the involuntary Function. For from hence the frequent alteration of the Pulse and of Respiration, also Cramps of the *Viscera*, and convulsive motions arise unknown to us, or also against our wills. But an impression sent from elsewhere to the Cerebel, and inducing the same kind of a troublesome sense, either ascends by the passage of the Nerves from the *Præcordia* and *Viscera*, or it is carried from above from the Brain by the passage of the orbicular Prominences; as shall be shewn more largely anon.

In the mean time, from these things already shewed of the passive power or sense of the Cerebel, it may be easily collected, by what means, with what order and series the animal Spirits, arising from the same, are moved. But first you must distinguish between their twofold motion. For one is customary and ordinary, consisting in a perpetual and equal efflux of Spirits; by which indeed, they flowing into the beginnings of the Nerves nigh their risings, especially of the intercostal and wandering pair, the solemn acts of the Pulse, Respiration, Chylification, and others of the involuntary Function are performed. Then secondly, the other motion happens extraordinary and occasional, which the same Spirits perform confusedly, as it were in disturbed orders: as when the Pulse becomes quicker or slower than it ought, or the Respiration unequal or interrupted; and when the other Faculties, which belong to this Class, are perverted from their regular and constant manner. But these kind of extraordinary motions are again twofold, to wit, for that its instigation proceeds from a double bound; for the impulse whereby the Spirits inhabiting the Cerebel, are compelled into an irregular action, (as we have but now intimated) is carried either from beneath, *viz.* from the *Præcordia* and *Viscera*; or it is wont to be transmitted from above, to wit, from the Brain.

As to the first, if at any time the *Præcordia* grow too hot, and are burnt with a feverish heat, presently by the passage of the Intercostals and the wandering pair of Nerves, the Spirits residing in the Cerebel being warned of this evil, institute more frequent and stronger acts both of the Pulse and of Respiration. In like manner, if by chance the humors and sharp Juices irritate or greatly trouble or afflict the Coats of the Ventricle or Intestines through the sense of this affection communicated to the Cerebel, the Instinct of performing the motion is reciprocated, whereby the fibres of the parts, being contracted and wrinkled together, endeavour the shaking off of the hurtful matter. More instances might be here brought of all the other acts of the vital or merely natural Function, of which besides it may be observed, that when a sense of the trouble is immediately conveyed from the *Præcordia* or *Viscera* to the Cerebel, this affection, like the waving of waters, is either stopt or terminated there, from whence a motion, as the business requires, unknown to the Brain, is presently retorted, as when the actions of the *Præcordia* are altered by a feverish distemper without our knowledge; or secondly, that sense of the trouble being transmitted to the Cerebel, for that it is more vehement, it unfolds it self more largely, and like a strong waving of waters, passing through the Cerebel, goes forward further even to the Brain, and warns its inhabitants of the evil; by which they being incited to oppose the enemy, cause a motion of another kind: So (as hath been said) when the *Præcordia* grow cruelly hot, the Cerebel feeling this, makes the Pulse and Respiration stronger. But further, the Brain being warned of the same trouble, seeks and diligently requires cold drink and other remedies to moderate the heat. Moreover, it is after this manner also in several other actions, which though they are regular, yet being made in the Brain without any previous knowledge, they are said to be done by Instincts merely natural; as when brute Animals, being newly brought forth, presently seek for the Dams Teats, and greedily suck; or Birds, without any shewing or Example, build Nests with wonderful Art, lay eggs, and hatch young ones. In these kind of works the Brain being taught

taught before by none : directs fit means to the ends instituted by Nature : which indeed seems to be done by this means. The sense of every necessity being brought to the Cerebel, incites the Spirits inhabiting it to succour it ; which when they are not able to do, the impression going from thence further forward, is carried to the orbicular Prominences : by which the Spirits there inhabiting, being presently struck, form the Appetite or the intention of performing, which being thence communicated to the Brain, it readily causes that local motions, fit for the executing of the work, be retorted. Of these we shall speak anon a little more largely, when we treat of the respect which happens between the orbicular prominences and the annular Protuberance.

In the mean time, we shall take notice in the second place, that the irregular motions of the Spirits inhabiting the Cerebel, are wont also, by reason of the force of the affections, to be transmitted from thence to the Brain : for as often as a violent passion, as Joy, Sadness, Anger, Fear, or of any other kind, is conceived in the Brain, presently the impression of the same being brought through the by paths of the Prominences into the Cerebel, disturbs the Spirits destinated to the vital or merely natural Function in their very fountain, and for that reason presently induces notable mutations in the Organs of those Functions.

What hath been spoken hitherto of the Cerebel being employed about the offices of the involuntary Function only, also concerning the sense and the motions both usual and irregular of the Spirits inhabiting it, will be made more clear, if lastly we shall shew the offices of the Nerves and of the other processes, immediately depending upon the Cerebel, to be no other than such as perform only involuntary Acts : which shall be briefly and succinctly done, as far as is pertinent to our purpose, because a more full consideration of them is left to another place.

CHAP. XVII.

Of the Nerves, which receivng the stores or companies of the Spirits from the Cerebel, bestow them on the Acts of the involuntary Function.

WE have already shewed, that out of the annular Protuberance (which is a certain Process of the Cerebel) three pairs of Nerves, to wit, the fifth, sixth, and seventh immediately arise. We have said that Protuberance to be as it were a Repository or Store-house, wherein the Spirits flowing out of the Cerebel, and to be derived into the depending Nerves, as occasion serves, are kept : and in the mean time, whilst they remain there, they who stream out from either middle Marrow of the Cerebel divisively, meeting mutually in this Cirque, are united together. But as the aforesaid three pairs of Nerves receive the forces of the Spirits from the Cerebel by the mediation of that Protuberance ; so also the eighth pair having its rise near the insertion of the other (*viz.* the lowest) medullar Process sent down from the Brain, seems to derive by its passage the influence of the Spirits not less from the Cerebel : wherefore when these four conjugations of Nerves owe the Tribute of their Spirits wholly to the Cerebel, if I shall shew that all these Nerves serve chiefly and almost only to the involuntary acts of the Senses and Motions, surely this will be a signal Argument, that according to our Hypothesis, the office of the Cerebel is to beget and to dispense the animal Spirits requisite for the involuntary Functions.

Therefore in the first place we observe of the fifth and sixth conjugation of Nerves, that as this arises out of the Basis of the greater Ring, and that from its sides both in man and in four-footed beasts ; the fifth pair being carried more forward, distributes its branches into the Glandula's of the Eyes, into the Nostrils, into the Palate, Teeth, yea and into most parts of the Face and Mouth ; but the sixth pair is wholly bestowed on some Muscles of the Eyes. Further, out of the trunk of the fifth pair two shoots ; and another out of the Nerve of the sixth pair bending back behind, meet together ; and what is wonderful, and not before taken notice of by Anatomists, the intercostal Nerves, destinated to the *Præcordia* and *Viscera*, do make a Trunk ; so that the Nerves, of the fifth and sixth pair stretch out a double Ramification, to wit, one more above about the parts of the Mouth and Face, and the other lower through the *Viscera* of the middle and lowest Belly. But it will appear clearly to any one considering this thing more carefully, that the chief branches of either partition are employed about the involuntary offices of Motion and Sense, of which sort those are chiefly, that either cause the passions, or perform the natural Instincts.

1. Concerning the intercostal Nerve, which (as was said) being radicated in the Nerves of the fifth and sixth pair, depends as to its origine wholly on the Cerebel, it is not here to be doubted but that it looking towards the *Præcordia* and *Viscera* in a man, and towards these latter only in most four-footed beasts, is bestowed on the Functions only vital and merely natural, and so confers little or nothing

thing to spontaneous Actions. Further, forasmuch as this Nerve reaching forth into *Præcordia* and *Viscera* of the whole Abdomen, is continued by its superior ramification also into the Eyes, as also into the parts of the Mouth and Face; certainly from hence a true and genuine reason may be given wherefore in every passion the Eyes, Face, and Mouth do so correspond with the affections of the *Præcordia*, often unknown to us or against our minds, that oftentimes we are compelled to betray the most intimate sense of the Heart by the continuance and aspect. Yea, hence a reason may be brought, why in sneezing, yawning, laughing, and crying the Muscles of the Face conspire so in motion with the *Præcordia*. Besides, when in man different from any other living Creatures besides, as we shall shew afterwards, many shoots are sent from the intercostal Nerve to the Nerve of the Diaphragma; this certainly is the cause why risibility is the proper affection of man.

But the Trunk of the fifth pair being carried more forward, and distributing its branchings through the parts of the whole Face, causes the same not only to be pathetically moved, and figured according to the affections of the *Præcordia*; but also produces some acts, both of motion and sensation, of another kind, which for the most part are involuntary, and so seem to depend wholly upon the Cerebel immediately. For example, this Nerve imparts shoots to, either mandible requisite for the business of chewing: but it is very well known, that the taking in of the food at the mouth is the first and oldest business of every Animal, which indeed is taught by natural Instinct before any knowledge of the Brain. But as to the Senses, the branches of this pair conduce something to the smelling, but for the most part for the knowing and chusing of favors. Hence it comes to pass, that as odors refresh the Brain by the smelling Nerves, so also they affect the Cerebel by the branch of this pair, and are wont by that means to recreate the *Viscera* and *Præcordia*. But savors or tastes (for that they are almost the peculiar Province of this) carry whatsoever they have of pleasantness or trouble, first to the Spirits inhabiting the Cerebel, and then by their consent to the *Præcordia* and *Viscera*. Hence it is, that a Pectoral not only allays hunger, but the very first tasting of Wine raises up those that are fainting or swooning away. Moreover, forasmuch as from this Nerve certain branches serve for the taste, and others for the smell, there is contracted so strict an affinity between either of these Sensories, that nothing pleases the taste unless it be approved of by the smell: and the loss of one of these senses oftentimes causes the privation or the diminution of the other.

2. Concerning the Nerve of the sixth conjugation we observe, that as one shoot is bent back for a root of the intercostal Nerve, the remaining Trunk of it being carried forward towards the ball of the Eye, is distributed to two of its Muscles, viz. to the seventh, proper to beasts, and to the drawing Muscle. Hence may be inferred, that this Nerve, besides the influence of it bestowed on the vital and natural Function, serves also for the producing some pathetick motions of the Eye, to wit, such as are wont to obey the affections of the *Præcordia* and *Viscera*; so that the whole provision of the animal Spirit, which it receives from the Cerebel, it bestowes only on involuntary acts.

3. The seventh pair, or the hearing Nerves, seem also to depend upon the Cerebel, forasmuch as they take their originals out of the annular Protuberance: but the use of them is a little otherwise in man than in four-footed beasts. For in him the annular Protuberance is one, and that very big, from whose lower margin the auditory Nerves proceed: but in Brutes the Protuberance is twofold, viz. one greater, sent down from the Cerebel, in which the beginnings of the fifth and sixth pair of Nerves consist; then near this there is another lesser, and as it were secondary, from which the auditory Nerves proceed. This lesser and lower Ring doth not so manifestly depend on the Cerebel, as the former; but there is stretched out from either height of it a white medullar line upon the oblong Marrow in the bottom of the fourth Ventricle: so as this seems to receive either the Spirits from the oblong Marrow, or at least to carry into the same the sensible Species: for what use it is so constituted shall be inquired into afterwards; for concerning these Nerves of the seventh pair, forasmuch as some offices of them very much illustrate the government or œconomy of the Cerebel, we shall discourse here a little more largely.

Therefore in man, who hath got a great and undivided annular Protuberance, and auditory Nerves coming out of its margin or brim, shews its stock received of the Cerebel: by which means we may see the tasks of those Nerves quadrate with the assigned government of this. We have shewn before the Processes (which in a manner may be called distinct Nerves) of the seventh pair to be twofold on either side: one, the softer of these, serves only for the sense, but the other harder seems to perform some motions. This latter Nerve, being carried without the Skull, is divided into three branches, all which serve to pathetick motions, or at least to such as are performed without consulting the Brain.

1. The first of them being bent back towards the auditory passage, is bestowed on the Muscles of the Ear. Without doubt, by the action of this, it is effected, that all Animals at the sudden impulse of a sound or noise, erect their Ears as it were to catch the sound too soon passing by. 2. The other branch of this same Nerve climbing over the Muscles of the Jaw, sends forth shoots towards either corner of the Eye: which are inserted into the muscles lifting up the Eye-lids; the office of which is certainly to open suddenly the Eyes at the sudden approach of any sound, and as it were to call them forth to watch, that by the stroke of the Air being brought to the Ear, the Eye might presently look about to see what is the matter, and whether there might be any danger near or not: which also all creatures do unthought of. 3. The third branch of the same auditory Nerve descending towards the root of the Tongue, is distributed to its Muscles, and to those of the Bone *Hyoides*, and so actuates some of the Organs for the framing the

the Voice. For this reason in some measure it comes to pass, that living Creatures being astonished at an unaccustomed or horrid sound, presently putting forth an uncertain voice, cry out and make a noise. But the conformation of these kind of Nerves in man serves for another more noted use, to wit, that the voice might fitly answer to the hearing, and that this might be set as the Echo of the sound admitted by this: so indeed, as on the other side, there be two Nerves of the same pair, the sound is received by the hearing, through one, which is rendered again by the voice through the other. The common and extrinſick Echo conſiſts in this, that a certain undulation or waving of the Air shaken or moved, being ſtirred up, and tending towards or about, when by reason of ſome ſtop or hinderance, it cannot go any further directly, being preſently repercuffed or ſtruck back or reflected at certain angles, it is terminated contrary to the former bound. In like manner, in the hearing, the impreſſion of the ſound, or the Species admitted to the Ears by the hearing faculty of the Proceſſes of the ſame or neighbouring Nerve, and being carried inwardly towards the Cerebel and common Senſory, and from thence again reflected on the vocal proceſs, it is carried out by the Mouth. But between theſe there is ſome difference, to wit, foraſmuch as the outward Echo renders back the ſound immediately; but the ſound of the Hearing is, not neceſſarily carried forth at the mouth preſently, but that this leaves an Idea in the Head, according to which afterwards, as occaſion ſerves, the voice is formed, which bears the type and image of that, though ſome time before admitted.

But here (if I may digreſs a little) we ſhould inquire in what part of the Head the Ideas of ſounds are left: whether only in the Brain, which is the Cheſt of Memory acquired as it were artificial; or whether not alſo in the Cerebel, which is the place of natural memory? Truly we ſuppoſe, that ſounds belong to both theſe, as it were to diſtinct Store-houſes. Every audible impulſe being ſtruck againſt the Ear, it is preſently carried by the paſſage of the auditory Proceſs to the annular Protuberance; but from thence it is carried, as other ſenſible Species, to the chamfered bodies or the common Senſory; (which way it paſſes thither, ſhall be ſhewed afterwards) this impreſſion tending from thence farther, and being alſo delivered to the Brain, ſtirrs up the Imagination, and ſo leaves in its Cortex an image or private mark of it ſelf for the Memory. Further alſo, as the auditory Proceſs depends on the Cerebel, and receives from it the proviſion of the animal Spirits: ſo it is moſt likely, that by the reſeſ of the ſame Spirits the Ideas of the Sounds are conveyed alſo to the Cerebel; which forming there footſteps or tracks, impreſs a remembrance of themſelves, from whence when afterwards the Species there laid up are drawn forth by the help of the vocal proceſs, voices, like the ſounds before admitted, and breaking forth in a certain ordained ſeries, come to be made.

Hence it is uſual, that muſick or melody is ſoon learnt by ſome men, which afterwards they bring forth with exact Symphony, without any meditation or labour of the Brain; to wit, from the diſtinct accents of the heard harmony, the Spirits moving within the Cerebel are diſpoſed into peculiar Schemes; according to which, when they flow on both ſides into the vocal proceſs of the auditory Nerve, they render as it were with a certain ſpontaneous voice, and like a Machine or Clock with the ſucceſſion of Species, the meaſures or Tunes of the Inſtrument which they had drunk in at the ears. Without doubt hence the reaſon may be ſought, why ſome men learn Muſick without any trouble, and others hardly or not at all. For it is obſerved, that ſome Children, before they can ſpeak diſtinctly, quickly ſing, and remember certain Tunes; whiſt others, though very ingenious men and of excellent memory, are very Fools at Muſick, and become incapable, as an Aſs for the Harp; wherefore 'tis commonly ſaid, that ſome have muſical ears, and others are wholly deſtitute of that faculty. In the mean time, 'tis to be confeſſed, that in theſe the Organs of the Voice are not defective; but all the fault, though wrongfully, is caſt on the hearing.

But in truth the genuine cauſe of this defect ſeems to conſiſt in this, that when in all, the audible Species go to the Cerebel ſooner and more immediately than the Brain; yet in ſome the Cerebel being harder, and not eaſily yielding to the received impreſſions, thoſe Species, becauſe they could impreſs nothing of themſelves in their paſſing to the Cerebel, being carried towards the common Senſory, leave their Types or Ideas chiefly and almoſt wholly in the Brain: which part being ſtill buſied with diſturbed motions, is leſs apt to keep diſtinctly the compoſures of Harmony. But in the mean time, in others the Species of audible things, beſides that they are carried to the common Senſory and to the Brain, do alſo affect the Cerebel, eſpecially if they are harmonically figured (foraſmuch as in them there is a ſofter capacity of the impreſſions) with a peculiar order and Scheme of the animal Spirits: where, as the Species of the Harmony being diſpoſed in convenient little places and cells are kept, afterwards they flow out from thence, almoſt unthought of, without any endeavour or labour of remembrance, but in a diſtinct ſeries, and as it were in compoſed modes and figures, and ſo by blowing up the vocal proceſſes, they conſtitute ſweet Tunes and vocal Muſick.

If that the divers ways of paſſage are inquired into, to wit, whereby the audible Species, being carried into the annular Protuberance, do get both to the Brain and Cerebel; I ſay it is not improbable, but out of that Protuberance both a paſſage lyes open into the underlying tract of the oblong Marrow, and as it were the high road; as alſo another paſſage is opened into the Cerebel through the medullar proceſſes of the ſame Ring. But leſt there ſhould perchance be a confuſion of the animal Spirits and the ſenſible Species, (which indeed can hardly be avoided) if the way made for their paſſage ſhould lye open into various paſſages and manifold apertures; therefore concerning this it may well be ſuppoſed, that the Ideas of the Sounds paſs through the Cerebel, when they are carried to the common Senſory; which region being firſt

past, they are at length brought by a by-path, *viz.* through the orbicular Prominences to the charnfered Bodies: which perhaps is partly the reason, that in the Hearing the perception of the sense succeeds so late, and the impulse of the object, in respect of sight, follows so slowly.

Whilst therefore the audible Species passes through the Cerebel, in some men, it leaves in this region (for that it is of a soft temper, and fit for the receiving impressions) and tracts and marks of it self, and so they obtain musical ears. But in others who have a harder frame of the Cerebel, they produce no tracts of the same Sounds, and therefore such are wholly destitute of the faculty of Musick.

As therefore we suppose the audible Species to pass through the Cerebel after this manner, a reason may be given from hence, wherefore Musick does not only affect the Phantasie with a certain delight, but besides cheers a sad and sorrowful Heart: yea, allays all turbulent Passions excited in the Breast from an immoderate heat and fluctuation of the blood. For since the animal Spirits, serving for the motion of the *Præcordia*, are derived from the Cerebel; as the perturbations conceived in the Brain, the influence being transmitted hither by moving these Spirits, in the Fountain it self, transfer the force of their Affections on the Breast; so the Melody introduced to the Ears, and diffused through this Province, does as it were inchant with a gentle breath the Spirits there inhabiting, and composes them, called off from their fury, to numbers and measures of dancing, and so appeases all tumults and inordinations therein excited.

From these may in some measure be known the reason of the difference, why the hearing Nerves are after a different manner in man and in four-footed beasts: for, because in these there is little need that the audible Species should pass through the Cerebel, either for the reciprocations of the sound heard, by the voice, or for the impressing there the Tunes of the Harmony (for neither is Musick required, what ever Poets feign, to the taming the Affections which move the breasts of beasts) therefore in these (I mean in four-footed beasts) the annular Protuberance dispensing the animal Spirits to the auditory Nerves, and receiving from them the sensible Species, requires not so strict an affinity with the Cerebel: yea, whenas in man may suffice, that those Nerves arise from the oblong Marrow, yet the annular Protuberance, as it were a common Porch, ought to be prefixed to them; to wit, in which both the Spirits going out from either side, and the sensible Species to be carried to either, ought first to be mixed and united together, lest otherwise every sound should become double.

Among the Nerves which are seen to belong to the Cerebel, and to perform its offices, lastly follow the eighth or wandering pair, which indeed hath its rise out of the common Trunk of the oblong Marrow, near the place where the last process of the Cerebel is terminated, and over against where the pyramidal bodies, being produced from the annular Protuberance, end: so that we think these Nerves also, by that process coming between on either side, and also perhaps in some measure through the passage of the pyramidal bodies, do derive all manner of influence of the animal Spirit from the Cerebel.

The beginning of these consists of very many fibres and filaments or little threads presently distinct one from another; to which belongs, from the very beginning of every Nerve, a noted Trunk arising out of the spinal Marrow. The description of the wandering pair of Nerves, and its protension into the *Præcordia* and some *Viscera*, are added hereafter. For the present it shall suffice, that we take notice, for that as much as this Nerve is bestowed chiefly on the *Præcordia*, the acts whereof are involuntary, and are performed without our care or knowledge in sleep as well as waking; and for that the same Nerve seems to receive the forces of the Spirits wholly from the nearer fountain of the Cerebel; from hence it may certainly be well concluded, that the government or œconomy of the Cerebel regards only the involuntary Function.

So much for the Nerves, which being subjected to the Government and Laws of the Cerebel, seem to obey and serve under it: among which moreover ought to be placed the fourth pair, or the pathetick Nerves of the Eyes, to wit, which arising out of the first processes of the Cerebel, come between that and the orbicular Processes; of the use of which we have spoken already. Further, we shall here take notice, that some other Nerves to be described below, for that they communicate with the aforesaid Nerves near their originals, cause also some involuntary acts to be performed; of which sort are first the ninth pair, the spinal Nerve accessory to the wandering pair, also the Nerve of the Diaphragma, and some others, as we shall shew more at large in the particular History of the Nerves.

We may also observe, concerning the Nerves but now described, which owe their stock to the Cerebel, and seem to be designed for the offices of the involuntary Function, that sometimes some of them, though of another Dominion, are compelled to obey the beck and government of the Brain: for we are wont to draw the parts of the Face, usually moved pathetically and unthought of, and also at our pleasure, into these or those Configurations or postures: we are able also in measure to alter the motions and actions of the *Præcordia* and *Viscera* at the will or command of the Appetite. The reason of these is, partly because the Nerves of either Government communicate variously among themselves with shoots sent forth one to another, so that oftentimes the offices of the one are drawn into the parts of the other. But besides, we have mentioned before, that the sensible impression being inflicted on the parts of the involuntary Function, forasmuch as it is vehement, like a strong waving of water, passing through the Cerebel, affects the Brain it self. In like manner it may be thought concerning the motion which belongs to those parts, *viz.* that made after the ordinary manner, that it is performed by the command of the Cerebel. Notwithstanding some more severe Edicts of the Brain, by the by-passage of the Prominences, belong also

also to the Cerebel, and determine the Offices of the Inhabitants of it to be performed at the beck of the Appetite. As every one sees that violent Passions (whether the will be privy or not) easily do this; why therefore may not the will it self also, as occasion requires, exercise the same dominion? But in the mean time, this derogates nothing from the privileges of the Cerebel, that it may not be called a free and municipal City, and so Mistress of the involuntary Function; for that in some few it is alter the manner of the Brain: because the Brain it self in many things is compelled to serve the Cerebel and its Government, as we have already shewn, and is necessarily bound to it. For the Brain owes much to the Cerebel, forasmuch as it receives from the vital Function (which is of its Province) the provision of the blood, and by consequence the Tribute of the Spirits produced of it: so indeed that both these parts, though Principals, perform mutual offices, and as it were in a circle, require and accomplish services one for another.

CHAP. XVIII.

Of the relation or mutual respect of either Appendix of the Cerebel, to wit, of the anterior, which are the orbicular Prominences; and the posterior, viz. the Annular Protuberance: Also of the remaining portion of the oblong Marrow continued into the Spinal Marrow.

BESIDES the aforesaid Nerves, to wit, the fourth, fifth, sixth, seventh, and eighth pair which are employed for the performing the tacit Edicts of the Cerebel for every involuntary Function, and those equal in number to the rest subject to the Brain, that cause the Cerebel to have an Empire divided with it; there are also some Proccesses and Protuberances, which being placed before and behind the Cerebel, are its Appendixes, that are taken into part of the same Office and Ministry. The description and use of these, are already particularly delivered. But for that (as a while since we intimated) there happens a certain respect or habit between the orbicular Prominences, which is the anterior Appendix of the Cerebel, and the annular Protuberance, which is the other posterior Appendix of the same, and that one part is proportionate to the magnitude of the other; so as when the natiform Prominences are greater or greatest, the annular Protuberance is always smaller or smallest; and on the contrary, they who have this latter in a very great bulk, in them the other is lesser; and so for that either part seems to be a peculiar Repository of the Spirits, which belong to the oeconomy of the Cerebel, when a greater provision of them is laid up in one Store-house, therefore there resides a lesser in the other; when I say there is this kind of constant relation found between these parts, it yet remains for us to find out for what end this is so constituted.

Seeing that the animal Spirits are disposed within the several parts of the Head in distinct Schemes of Rays, through which are variously transmitted, as through Perspective glasses, the impressions of sensible things and the instincts of motions to be performed; it easily occurs, that there are commerces had this way and that way in the natiform Prominences between the Brain and Cerebel; and that the Spirits inhabiting the annular Protuberance are *Internuncii* or Messengers going between, which transfer the mutual respects of the *Præcordia* and *Viscera*, as also of the parts that are wont to be pathetically moved. But if it be inquired into, what kind of commerces and respects those are which the Brain carries to the Cerebel, and on the contrary, and that either have to the Organs of the vital and merely natural Function, we shall in so difficult and very intricate a matter propose our Opinion, though with an hesitating and doubtful mind.

We have before intimated, that the orbicular Prominences did deliver to the Cerebel the forces of the Passions to be carried from the Brain the *Præcordia*, and did receive from it, and communicate to the Brain the necessities of the natural Instincts delivered from the *Præcordia* and *Viscera* to the Cerebel. To these moreover we add, that the annular Protuberance serves wholly for the same offices, though after another manner; to wit, this receives the forces of the Passions, as it were at a second hand, from the Deputiship of the Cerebel, and transfers them then immediately to the *Præcordia*; and this seems to be the chiefest office of this part. Further, the same Ring receives immediately the natural Instincts from the *Viscera* of the middle and lowest Belly, and impresses them on the Cerebel to be conveyed further to the Brain; which kind of use it exhibits secondarily by affording only a way of passage: For indeed such Instincts having past through the Cerebel, we suppose to be formed and perfected within the orbicular Prominences, from whence being transmitted into the Brain, they draw forth requisite actions without the previous knowledge of it, or intention of doing.

Hence it may be supposed, that the annular Protuberance contains chiefly the animal Spirits which perform the intestine commotions of the Affections. In every violent passion of the Soul, presently the *Præcordia* are greatly troubled, to wit, the same being variously drawn together or spread abroad, compel the blood into divers fluctuations; but indeed a great company of the Spirits, somewhere got together and ready for Excursions in a set Battel, do perform these disorders and irregular motions of the *Præcordia*; and for that the Spirits can be disposed for this in no other part than here, before the beginnings of the Nerves, constituted for these offices; therefore this Protuberance in a man, by reason of the ragings of the passions to be performed by a certain force and incitation, is far greater than in any other Animal. For as he is wont to be suddenly and vehemently disturbed, therefore the Promptuary or Store-house is required to be more large, in which a greater plenty of Spirits may be kept, to be bestowed on such inordinations of the Affections. Next to a man this part is greatest in a Dog, Cat, and Fox; in a Calf, Sheep, Goat, Hare, and other milder Animals it is very small.

But as the annular Protuberance seems to be the chief Organ or Chest of the Spirits, from whence the winds of the Passions, destinated for the exciting the *Præcordia*, are conveyed into the breast; so we suppose the orbicular Prominences to be a means of passage, and the very instruments whereby the instincts and necessities of the *Præcordia* and *Viscera* are communicated from the Cerebel to the Brain. Yea, the animal Spirits dwelling in this, as a retiring place, do not only transmit these kind of Ideas or formal Reasons of the Instincts, but in some measure form and prepare them for the Brain. For when as some brute Animals, whose Brain is not imbued with a previous knowledge or practical habits, chuse and bring forth some spontaneous actions as it were with judgment and deliberation, certainly we may believe the intentions of these kind of acts are suggested from some other place than the Brain, to wit, from the aforesaid Prominences. Wherefore 'tis to be observed, that in some Brutes endued with an indocile or dull Brain, the Buttock-like Prominences are greatest, as may be seen in a Calf, Sheep, Hog, and many others; which Animals, as soon as they are brought to light, presently seek for their food, and what is congruous for them they readily know. But in a Man, a Dog, Fox, and the like, who are more apt to learn and acquire habits, these Prominences are very small; and these Animals being newly born, are furnished only with a rude and imperfect sense; besides, they are found wholly unapt to seek out their food. Upon this Observation (which holds good in most Animals which I have yet happened to dissect) as upon a Basis or foundation I dare build this kind of abstruse Hypothesis concerning the natural Instincts and Affections of the *Præcordia*. For as the living Creatures which are more strong in instinct, as Sheep, Hogs, Oxen, Goats, and other slow and gentler beasts, that are not obnoxious to Passions, are also less docile or apt to learn; and on the contrary, they in whom the Affections are wont to predominate, and who are furnished with a certain wit, (as besides Man, are Dogs, Foxes, and some other hotter Animals) are less powerful in Instinct; and as I have observed in the frequent Dissection of all sorts of Heads, that in those kind of living Creatures, who live rather by Wit than Instinct, the annular Protuberance, placed below the Cerebel, was notably great, and the orbicular Prominences only very small; but in other living Creatures, where the Instinct exceeded the wit, and who were less prone to strong Affections, the orbicular Prominences were very great, and on the contrary, the ringy Portuberance exceeding small. From hence I was forced to think, that the orbicular or natiform Prominences, where they are great, are instead of another or supplementary Brain, and the chief Organs of the natural Instincts; yet so, as these parts also serve for a way or means of passage for the transferring the Passions from the Brain towards the Cerebel and *Præcordia*; and that (as we have all ready hinted) the greater exultency of the annular Protuberance is to contain plenty of Spirits requisite for the winds of the Passions; yet in the mean time, by a further tending forwards or declination of the Spirits inhabiting this, the Species of the natural Instincts, being sent from the *Præcordia* and *Viscera* pass through. But however the business is, because no thing can be certainly affirmed, or by demonstration, if this our Opinion please not others, at least it may be pardoned.

There remains not much more to be spoken concerning the Offices and Uses of the Cerebel and its Appendix. Concerning its substance, there is something more worthy taking notice of, to wit, that it very much differs in this respect from the structure of the Brain also, for that its cortical little circles are not founded in the stretched out Marrow, as the convolutions of the Brain; but being deeply cut in, are discontinued in their whole tract: so that the whole System of the Cerebel is as it were a cluster of Grapes compacted closely together; in which, although the Berries be contiguous, yet they remain distinct one from another, and bring forth fissures through the whole thickness of the mass. Yea the outward superficies of the Cerebel consists as it were of very many Tubercles or little Tad-stoles or Puffs which grow together on little stalks; and those stalks pass into greater branches, and they at length being bipartite or twofold, go together into two larger Marrows near the bottom of the Cerebel, in either of which are three distinct medullary Processes: of which threefold processes on either side we have already spoken. But of these concerning the use of the Cerebel in general, we shall yet further advertise you, that as very much of its substance is cortical, it begets animal Spirits in great plenty, to which in the circulating there is not granted, as in the Brain, an equally great space; for that there seems not to be much need of it in the animal Government. For the Spirits so produced in the Cerebel plentifully by a perpetual emanation, ought to flow outwardly for the offices of the natural and vital Function: but more inwardly for the impulses variously sent into them, they admit certain undulations or wavings, by which some occasional acts of the involuntary Function are brought forth, as is shewn before.

But as it is manifest enough, that the animal Spirits are generated within the cortical little circles of the Cerebel, it doth not seem needful that we should ordain their Work-house in the Ventricle subject to its frame. For that Cavity (as we have already shewn) is only an empty space, which lying under its double little foot and medullar Trunk, comes between it and the overlying bunching out of the Cerebel. But indeed there belongs to this besides a certain use, to wit, that the serous watry heap laid aside out of the Glandula's and infoldings of the Vessels, as also from the substance of the Cerebel, being made overmoist, distilling down, might slide into this Cistern. From whence, lest it should flow down upon the beginnings of the Nerves, by a restraining Membrane it is compelled into the hole of the trait Den lying under the orbicular Prominences; and from thence is received from the declining aperture of the Tunnel, and carried out.

Below the Cerebel, the oblong Marrow going forward with the rest of its tract even to the hole of the hinder part of the Head, ends at length in the spinal Marrow, but in its Trunk, as yet contained within the Skull, besides the Nerves and Processes but now recited, the beginnings of the ninth and tenth pair of Nerves are also radicated. Of what there will be hereafter a proper place to speak, when we shall institute the whole Neurology or the Doctrine of the Nerves. In the meantime, we shall take notice of the beginning of the ninth pair, which is peculiar in Man, and different from what is found in Brutes: To wit, in Man below the origine of the eighth pair, a certain Protuberance grows on either side of the oblong Marrow. Out of that four or five distinct Fibres do come forth, one or two of which binds about the Vertebral Artery passing through it, but all grow together into the same Trunk, which is the Nerve of the aforesaid pair. This Protuberance, the *Pia Mater* being pulled away, may be easily seen, and seems to be the Repository or Store-house of the Spirits destined to this Nerve.

For as this Nerve is bestowed on the Tongue and its Muscles, and so conduces chiefly to the performing of speech in Man, who hath a greater and more frequent use and exercise of the voice, there seems to be need of a great provision of Spirits, plenty of which ought always to be in a readiness. But in Brutes, who have none, or a rarer necessity of the voice, such a Protuberance is wanting, because it is not required in them that the Spirits should be gathered together by heaps, as it were in a certain Porch, before the Organs of the Voice, but that it may suffice for them to be called forth by degrees out of the common tract of the oblong Marrow. Further, whereas some fibres of this Nerve bind about either Vertebral Artery, unless I am deceived, that is so ordained for this end, lest perhaps in speaking, when at any time we are more vehemently moved, the blood being stirred up, might rush upon the Brain with a torrent. For this Nerve binding about the Vertebral Artery, as it were with a bridle, and so as a Moderator not only of the Tongue, but also of the Blood, restrains its more rapid influence. After the same manner, and for no other ends do recurrent Nerves, destined to some part of the same office, variously bind about the Trunk of the great Artery, as shall be shewn afterwards.

As soon as this inferior portion of the oblong Marrow is unclothed from the *Pia Mater*, the pyramidal bodies come in a view otherwise lying hid. These in all Animals, endued with the annular Protuberance, are constantly found; also as that Protuberance is bigger, so these bodies appear more noted: but indeed in a Man and a Dog they seem like two large Nerves, which being produced out of that Ring, end over against where the eighth pair arise in sharp points. If the use of these be sought into, it is most likely, that the animal Spirits superabounding in the annular provision or store, do flow out as it were by these Emissaries, which Spirits however run into the beginnings of the eighth pair placed near, and so are bestowed by their proper means on the offices of the involuntary Function.

Although the oblong Marrow retains not its name beyond the limits of the Skull, yet it is the same substance, which from thence being continued further into the cavity and utmost recesses of the whole Spine or Back-bone, is called the Spinal Marrow: but it is brought forth for this, that the Nerves to be distributed into the Limbs and Members more remote from the Head, might more commodiously arise out of the same medullar substance stretched out into the neighbourhood of every part. Indeed all this whole medullar Trunk, which is continued from the bottom of the Brain even to the *Os sacrum*, seems like the Pneumatick Chest, or Bellows of a pair of Organs, which includes the blast or breath destined to every Pipe; for in like manner the animal Spirits are contained in this marrowy tract, which blow up and actuate all the Nerves hanging thereto, as occasion serves.

If you behold the origine of the whole, it seems that the whole frame both of this oblong Marrow and the spinal, is of a medullar or marrowy substance, every where growing dispersedly through the Brain and Cerebel, and then being gathered more round together in the middle of either, becomes as an heap. For the Marrows besmearing all their folds and turnings about, are as so many little rivers, which springing from thence, begin to be congregated in the middle, and to be poured out in one great one; but being from thence united, they make the oblong Marrow, as it were the chanel of the Sea, big enough for the motion or ebbing and flowing and reciprocation of the animal Spirits: which belly or chanel, however stretching it self further beyond the Skull, is increased into the spinal Marrow, as it were the bottom or process of the former.

But as the medullar tracts, besmearing the folds and convolutions of the Brain and Cerebel, unfold themselves into their middle Marrows and medullar Trunk, and so the Spirits springing dispersedly from their first fountains, congregate as it were into a certain diffused Sea; so from this Sea, causing an ebbing and flowing, or a continual or very frequent influence of the animal Spirit, the same Spirits flow out into the depending chanel of the nervous System.

Concerning this part of this Marrow, which being included in the long bosom or chanel of the *Vertebrae* or Back-bone, and according to all their joyntings, being marked with as it were knotty processes, is called the Spinal, there occur not many things worthy consideration, besides what are commonly known. The figure, situation, as also the body of this, in its whole tract, are known generally to be cloven in two, not only by Anatomists, but by every Butcher. The ramifications or branchings of the Nerves, proceeding from the spinal Marrow, are delivered hereafter. Concerning its conformation, something peculiar occurs. For as the spinal Marrow is as it were the common passage or chanel of the Spirits flowing out of the Head into the Nerves, it may be observed, that this chanel, not after the usual manner of other passages, where many rivers flow in, doth swell up more; but on the contrary, in what place it hath more and greater Emissaries, its magnitude is increased; for in those parts of the spinal Marrow, out of which the brachial and crural Nerves arise, (or those Nerves belonging to the Arms and Legs, whose beginnings are more and larger) its Trunk becomes much thicker than in the rest of the frame or substance. The reason of this is, because within the medullar tracts the animal Spirits run not, nor pass through with so swift a passage, but for the most part flowing leisurely from their Fountains, when they have filled the whole space, they stay therein; and as many Spirits, upon occasion offered, are wont to be bestowed on every work, those remaining there in readiness frame certain convenient Promptuaries where they may divert themselves. Wherefore we ordinarily observed, not only of this Marrow, but of the Nerves themselves, that as often as a small branch is distributed into many shoots or suckers to be sent forth here and there, always in the very knot of the division there grows a far greater fold than in the rest of the Trunk of the Nerve; so that 'tis a wonder from whence the Nerve should acquire so in the middle of its passage a new substance and more ample bulk. But of these things and others belonging to the Doctrine of the Nerves, it behoves us to discourse in the following Chapters.

CHAP. XIX.

Of the Nervous System in general, where its parts (which are the Nerves and Fibres) being designed, a prospect of the whole Animal Government is exhibited.

WHen as hitherto having beheld the several Regions of the Brain it self, the Cerebel, and medullar Appendix, and the provision and offices of them all, we have designed or drawn forth the uses and employments also of the parts and processes, and the sanguiferous Vessels belonging to every one of these; it is now time for me to stop and retire into the Port from this troublesome and intricate Sea of Disquisition: But indeed, because I find that I have not yet reached to the farthest shores and utmost parts, but that beyond this Sea, which we have sailed through, as yet the nervous System, and very many Creeks or Bosoms, Meanders, and highly intricate Recesses or private places in it remain to be viewed; therefore although we know it is difficult to proceed with full Sail, we have resolved to undertake the task of the Doctrine of the Nerves; and the rather, because without the perfect knowledge of the Nerves, the Doctrine of the Brain and its Appendix would be left wholly lame and imperfect; for neither what hath already been delivered concerning them can be sufficiently understood or illustrated, nor (which I chiefly desire, and is the end of the former Disquisitions) without those things before known can the Pathology of the Brain and nervous stock be rightly instituted. And indeed there are many things which might easily deter any one from such an undertaking: to wit, the hardness of the work, and full of hazard; which promises at first sight more difficulty and thorny labour, than pleasure or profit. Then some will object, that this Province is already so perfectly cultivated, and adorned by former Anatomists, that by a repetition of the same, I may seem to have meddled with a thing done to my hand. But I may readily answer to these, first, That the Anatomy of the Nerves yields more pleasant and profitable Speculations, than the Theory of any parts besides in the animated Body: for from hence the true and genuine Reasons are drawn of very many Actions and Passions that are wont to happen in our Body, which otherwise seem most difficult and unexplicable; and no less from this Fountain the hidden Causes of Diseases and their Symptoms, which commonly are ascribed to the Incantations of Witches, may be found out and clearly laid open. But as to our Observations about the Nerves, from our following Discourse it will plainly appear, that I have nor trod the paths or footsteps of others, nor repeated what hath been before told.

Therefore

Therefore, that according to our determination we may enter upon the explanation of the nervous System, we shall comprehend under this name all parts, upon which gifted with the animal Spirit, Motion and Sense necessarily and immediately depend, to wit, for the performing either one only, or both together in the whole Body. But these kind of parts, in respect of the Head and marrowy Appendix, are like a branching stock or imps growing out of the trunk of a Tree: for supposing that the cortical substances of the Brain and Cerebel are in the place of roots, and that the substances every where medullar are taken for the stock or pith; the nervous germination or budding forth expanded into divarications of Nerves and Fibres, will appear like so many little branches, twigs, and leaves. Or if the Head containing in itself the chief part and power of the sensitive Soul, be taken for the body of some Luminary, as of the Sun or a Star; the nervous System shall be that radiant or beamy concretion compassing it about. Because the animal Spirits flowing from the Brain and Cerebel, with the medullar Appendix of either, as it were from a double Luminary, irradiate the nervous System, and so constitute its several parts, the Organs of Motion or Sense, or of both together, as hath been said.

The parts of the nervous System, as a radiant or beamy texture, are either primary, *viz.* the bodies themselves of the Nerves, into which the animal Spirits immediately flow from the Head and its medullar Appendix; or secondarily, which are Fibres planted or interwoven in the Membranes, muscularous Fleih, Tendons, and some of the Parenchyma, which also contain in themselves animal Spirits; but they receive them not but mediately and secondarily derived from the Head through the bodies of the Nerves.

We have already shewed that the animal Spirits are procreated only in the Brain and Cerebel, from which they continually springing forth, inspire and fill full the medullar Trunk: (like the Chest of a musical Organ, which receives the wind to be blown into all the Pipes) but those Spirits being carried from thence into the Nerves, as into so many Pipes hanging to the same, blow them up and actuate them with a full influence; then what flow over or abound from the Nerves, enter the Fibres dispersed every where in the Membranes, Muscles, and other parts, and so impart to those bodies, in which the nervous Fibres are interwoven, a motive and sensitive or feeling force. And these Spirits of every part are called Implanted, forasmuch as they flow not within the Nerves, as the former, with a perpetual flood; but being something more stable and constant, stay longer in the subject bodies; and only as occasion serves, *viz.* according to the impressions inwardly received from the Nerves, or impressed outwardly by the objects, are ordained into divers stretchings or carryings out for the effecting of motion or sense either of this or that manner or kind.

Indeed the animal Spirits flowing within the Nerves with a living Spring, like Rivers from a perpetual Fountain, do not stagnate or stand still, but sliding forth with a continual course, are ever supplied and kept full with a new influence from the Fountain. In the mean time, the Spirits in the rest of the nervous kind, especially those abounding in the Membranes and muscularous stock, are like Ponds and Lakes of Waters lately diffused from the chanel of Rivers, whose waters standing still are not much moved of their own accord; but being agitated by things cast into them, or by the blasts of winds, conceive divers sorts of fluctuations.

But because there is no light difference between the motions and consistency of the Spirits and of Waters, perhaps it will better illustrate the matter, if the Spirits of either kind, to wit, the inflowing and implanted, are compared to the beaming forth of divers rays of light. And so when light is let into a dark chamber, and presently inlightens the whole; we may conceive the particles of the light so swiftly diffused to be of a twofold kind; to wit, some are bodies sent from the light it self, which diffuse themselves every way into an Orb; and other luminous particles are as it were Etherial little bodies existing before in the pores of the Air, which being agitated by the former, and as it were inkindled, cause as it were a flamy, though most thin contexture, stretched out in the whole clearness. After the like manner, the animal Spirits flowing from the medullar substance into the Nerves, are as it were rays diffused from the light it self, and the other Spirits every where abounding in the Fibres, are as so many lucid particles included and implanted in the Air, which are actuated by the former, and being stirred up by them into motion, perform the acts both of the sensitive and locomotive Faculty.

That it may better appear by what means the animal Spirits do irradiate and swiftly pass through the parts of the nervous System, both primary and secondary; so that light is scarcely carried swifter through a diaphanous Medium, than the communication of the Spirits is made from one end of the nervous System to the other; it will be requisite to inquire here a little concerning the Origine of the Nerves and nervous Fibres, also of their Fabrick and Conformation, to wit, what pores and passages either of these bodies have, and how disposed for the passing through and commerce of the animal Spirits.

As to the Nerves, it is manifest from what hath been said, that all of them are produced immediately out of the medullar Trunk or its processes; so that as these parts are the common and broad roads which lead both from the Brain and from the Cerebel, all the Nerves are particular paths reaching out from them on every side into the several Regions of the animated Body. Wherefore the same Marrow, which is the original of every Nerve or Sinew, forasmuch as it is drawn into a more thin thread, constitutes the matter of the same Nerve; which indeed, that it may be made more solid and compact, is clothed with a peculiar production of the *Pia Mater*, for as from a Silver mass gilt or enriched with

Gold, all the threads produced from it are gilded; so the same Membrane, which covers the medullar Trunk, is produced together with all the Nerves coming out from the same, and clothes them all. Further, very many Nerves arising together out of that marrowy beginning, go forth as it were by bands; which notwithstanding, for the sake of the better passage, being presently united and carried out of their bony Cloister, are included in a common Coat taken from the *Dura Mater*. For we suppose (which also shall be more clearly shewed anon) that all the Nerves, destinated to any parts or every particular member, do arise distinctly and apart, and so remain in their whole passage. But in that oftentimes a Nerve appearing as it were one Trunk, afterwards seems to go into many branches, it is because those branches being indeed singular, and divided in the whole passage, are collected as it were into one bundle; for sometimes we have separated those Nerves, seeming to grow together as it were into one rope or cord of a Nerve, one from another, dividing them to their very original; for neither otherwise could the Instincts of the Motions to be performed be carried so respectively to these or those parts, separate one from another, to which the branches of the same Trunk belong.

The passages of the Nerves are not bored through as the Veins and Arteries; for the substance of those are not only impervious to any Bodkin, but no cavity can be seen in them, no not by the help of Spectacles or a Microscope. As to what belongs to the smelling little Pipes, they seem to be so made, not for the passage of the animal Spirits, but that some serosities might slide down that way: but the Spirits themselves are carried in the sides, and not in the cavity of either Pipe; but the substance of the other Nerves appears plainly firm and compacted, that the subtil humor, which is the Vehicle of the Spirits, may pass through their frames or substances, even as the spirits of Wine, the extended strings of a Lute, only by creeping leisurely through. Hence it may be argued, that because the animal Spirits require no manifest cavity within the Nerves for their expansion; neither is there need of the like for them within the substance of the Brain; but that the Ventricles, commonly so called, ought to be deputed to some other office than this.

But the Nerves are white, smooth, and round bodies: within the Skull and nigh their beginnings, being as it were only covered with the *Pia Mater*, they are soft and easily broken; without this, for that many of them are for the most part gathered together, and also cloathed with the *Dura Mater*, they become somewhat hard and more tenacious. The Nerves themselves (as may be discovered by the help of a Microcosm or Perspective-glass) are furnished throughout with the pores and passages, as it were so many little holes in a Honey-comb, thickly set, made hollow, and contiguous one by another; so the Tubelike substance of them, like an *Indian Cane*, is every where porous and pervious. Within these little spaces the animal Spirits or very subtil little Bodies, and of their own nature ever in a readiness for motion, do gently flow; to which is joyned, both for a Vehicle, as also for a Bridle or stay, a watry Latex, and that it self of very subtil parts. This Humor diffuses, with its fluidity the Spirits through the whole nervous System; also by its viscosity retains them, that they be not wholly dissipated, but as it were in a certain *Systasis* and continued Series; for it seems, that without such an Humor the Spirits could not consist within the nervous stock, but they would vanish away into Air. Further, the same Humor is no less required for the passing through of the sensible Species: because the animal Spirits, we suppose, like the rays of Light, to be diffused through the whole nervous System; and those rays, unless the humid particles of the Air be mingled with them, do not easily transmit the forms or images of things; as is obvious in an Optick Scene, which is hid or shadowed by the clear beams or brightness of the Sun. And in like manner, from the defect or depravation of the nervous Juyce, we can readily shew, that the inordinations of the animal Spirits, and oftentimes most horrid distempers of the Brain and the nervous stock do arise.

This nervous Juyce being derived from the Brain and Cerebel into the medullar Appendix, is carried from thence by a gentle sliding down through the Nerves even into the whole nervous stock, and waters its whole System. Upon the equal emanation of this depends the expansion of the animal Spirits through the whole; and the substance of these, yea the Hypostasis of the sensitive Soul it self is founded on the diffusion of the same humor. The animal Spirits being left to themselves, follow the motion of this Juyce, and flowing together with it in the same course, are pleasingly or quietly expatiated; but in the mean time, as occasion is offered, the same Spirits, as a breath moving upon those waters, conceive other spreadings abroad, and those more rapid. For as in a River, from winds or any thing cast in, divers undulations or wavings are stirred up; so the animal Spirits being raised up by objects for the performing the offices of sense and motion, do tend this way or that way to and fro within the nervous stock, and are agitated hither and thither by other means.

But to return to the parts of the nervous System, besides the Nerves themselves, Fibres also being perfectly interwoven in the Membranes, the muscous Flesh, the Parenchyma, and other parts, and united in the Tendons, are the Organs of sense and motion. Yea, the acts of their faculties are principally and more immediately executed by the Fibres than the Nerves; for they, by drawing together the Muscle and other motive parts, cause the motion it self; but the Nerves only carry from the Head the instinct for the performing of that motion. In like manner, in Sensation the Fibres receive first of all and immediately the impressions of sensible things, and express the same (as musical strings do the strikings of a quill or fingers) by an intrinsecal modification of the Particles, and represent the various approaches of the object by the like motion of the Fibrils, as by a moveable and fluid Character, whose Idea the Nerves transfer only to the Head.

Concerning the nervous Fibres it behoves us to inquire from whence they have their rise ? For it appears plainly, that they arise not immediately from the Head or its medullar Appendix ; not is it less improbable, that they are produced (as 'tis commonly said) from the Nerves : because what is asserted, that the Fibres are productions of the Nerves, and little bits or pieces of them torn off, as it were into hairy branches, seems unlikely ; for that the Fibres in some parts, being placed high, exceed in their bulk the magnitude of the Nerve that is brought to that part, at least an hundred-fold : which thing appears clearly from the Tendon of every Muscle, which being made up of united Fibres, is observed to be far greater than the Nerve inserted to it. And indeed for almost the like reason we are induced to think the nervous Humor it self also, whereby the Membranes and muscular Fibres are wont to be watered, to be derived unto them not by the only means and passage of the Nerves, because it is heaped up much more plentifully and in more abundance than can be carried thither through those narrow passages, as appears clearly in Ulcers of the Kings-Evil, or in Impostumes or Wounds of the Tendons and nervous parts, in which a glutinous Humor drops forth in so great abundance, that all the Nerves of the whole Body could scarce be able to supply it.

Wherefore concerning these, it seems that we may affirm, that the Fibres are not continued portions of the Nerves broken off into little hairy strings or Capillaments ; and that all the Fibres originally proceed not from the Nerves, because some of them, *viz.* those interwoven to the Heart and its Vessels are of equal birth with the Nerves themselves, and coexist with them together from the beginning. However the most Fibres, as to their production, depend upon the Nerves ; and all, which way soever brought forth, receive constantly from the Nerves the forces and supplements of the animal Spirits, and also Instincts of the Motions to be performed by them.

Therefore to recount the births or kinds of Fibres ; they are first either spermatick and first begotten, the rudiments or first beginnings of which being of the like antiquity as the Heart and Brain, placed in the Conception, afterwards leisurely Increase ; to wit, such are, as hath been said, those in the Heart it self in its depending Vessels, the Membranes and some other parts, which form the first stuff or threads of the Embryo : or secondly, other Fibres are produced secondarily, and by a second birth ; of which sort chiefly are such which are interwoven into the parts taken for the compleating of the animal Fabrick, and especially those termed Sanguineous, which we think to be begotten after this manner.

The Heart and Brain, with the Arteries and Nerves hanging to them, are primigenious parts, and highly original ; but these, for the second birth of others, and for the nutrition and increase of all the sensitive parts, distribute a twofold humor : *viz.* one spirituous and endued with very active Particles which perpetually flow, though but in a very small quantity, through the passages of the Nerves from the Brain and Cerebel ; and the other slow and softer, which being every where laid aside through the Arteries from the bloody mass, is rendered more plentifully. This latter being of it self dull and thicker by much, is actuated by the former, and being imbued by it, as by a certain Ferment, acquires strength and power of growth or vegetation. But indeed the nervous Juycce, so far as it diffuses with it self the animal Spirits, imparts to every part, besides the faculties of Motion and Sense, the determinations also of form and figure. Further, whilst that, being joyned to the other arterious humor, is disposed into the substance and matter of the member or part to be nourished, it forms some tracts as it were, to wit, the Fibres themselves, in which the animal Spirits, coming together with them, reside and are expatiated. These twofold or twin humors, coupling together in every sensitive part, constitute a liquor truly nutritious, to wit, which is both spirituous and nourishable. And in truth, both these Juycces, *viz.* the nervous and arterious, being married together, are as it were the male and female seed, which being mingled in a fruitful womb, produces the plastick Humor, by whose virtue the living creature is formed and increased. Hence may be observed, as the particles of the spirituous liquor, or of the other more watry juycce (*viz.* this latter being supplied from the Arteries, or that from the Nerves) are strong or excel, as to their properties or powers, all living creatures become more or less nimble, active, and ready to any motion and labour. Besides, from the default or depravation of the one and other humor excelling, the sorts or kinds of this or that disease are excited ; concerning which, and also what belongs to the explication of the nutritious Humor, we may perhaps have some other time occasion to discourse.

The animal Spirits which enter and fill the ordained series of the Fibres as so many little places, flow thither by the passages of the Nerves ; notwithstanding the Spirits which are seated in the Fibres, interwoven with the muscular stock, receive nourishment, yea and as it were auxiliary forces, from the arterious blood there plentifully flowing : whereby indeed both the Spirits themselves acquire for the performing of Motions a greater force and as it were elastick ; so that their force being stirred up by a strong endeavour, it seems like the explosion of Gun-powder ; and also the same Spirits being continually consumed within the Muscles more profusely than is wont to be in the Membranes and other parts, are in some measure made up or repaired from the bloody sustenance : because whenas the arterious Juycce joyns more plentifully with the nervous flowing within the sanguineous parts, it may be well thought, that it also lays upon the Spirits brought thither with it, as it were some nitrosulphureous particles, and intimately fixes them on them ; and so, by reason of this Copula, highly flatuous and apt to be rarified, the Spirits themselves become there more active, so that in every motive endeavour, whereby the Muscle is suddenly intumefied, they, as if inkindled, are exploded. Moreover, a sudden refection of the consumed or wasted Spirits, after great exercise or labour, is for this reason also performed by the blood ; for that the spirituous

particles being left and forsaken by motion, presently a new Copula of the same kind of matter, apt for explosion, is joyned to them. For it is not possible, that the immense loss of Spirits which happens in hard labours (if they were wholly destroyed) in so short of time, should be able to be restored by supplements coming only through the Nerves. We shall discourse more largely of these things, if at any time hereafter we shall treat of the Motions of the Muscles.

The animal Spirits being disposed within the several Muscles, according to the series of Fibres, seem as it were so many distinct Troops or Companies of Souldiers; all which being set as it were in a Watch-tower, are ordained, as a new impression is carried to them by the Nerves, either from the objects outwardly, or more inwardly from the Head, forthwith into various forms and peculiar orders for the performing of motion or sense of this or that kind. The carriage or behaviour of these is worth the seeing in an animal newly killed and its skin taken off. For when life perishes, and all the force of the Spirits flowing in through the Nerves hath quite ceased: yet the Spirits implanted into the whole Body breaking forth from the Muscles, still move and shake them, and force them into several Convulsions and trembling motions.

From what hath been said we may gather, what the disposition or order of the animal Spirits may be in the whole animal Body: to wit, those procreated in the cortical substance both of the Brain and Cerebel, are congregated into the middles of either, as it were into distinct Empories or Marts; and an expansion being made in either, they cause certain interior powers of the Sensitive Soul to be exercised; yet the same Spirits, affecting more room, enter the oblong Marrow (as it were the Chest, as hath been said, of a musical Organ) and fill it full; within which flowing, they carry to and fro the impressions of sensible Things and the Instincts of Motions. From the oblong and spinal Marrow the same Spirits, unless when they are otherwise busied, tending outwardly, flow towards the several parts of the whole Body; which notwithstanding wandring so out of doors, because they pass through very strait ways in their passage, to wit, the slender bodies of the Nerves, they break not forth in heaps, or in a thick troop, but only contracted orderly, and as is were by bands or divisions: but they being carried beyond the extremities of the Nerves, and there possessing the Membranes, Muscles, and other sensible parts, dilate themselves as it were into a most ample field, and with a very diffuse Army they dwell in the Pores and passages of the Fibres planted every where about; where also being endowed from the blood with new food, they become more lively and more expeditious or ready for the designed offices.

Here perhaps it may be demanded, how the animal Spirits, diffused in such numerous troops through the habit of the Body, are able to be supplied by so strait chanel of the Nerves? To which we reply, That those which reside more outwardly do not quickly evaporate, nor are remanded back by Circulation: wherefore when all the Fibres are filled by an influx of the Spirits made by little from the beginning, very small supplements suffice to repair their expence: For neither are those dwelling more outwardly, so that they are repaired by the bloody food, much consumed, though in frequent action.

Hence may be noted the difference between the distributions of the blood and animal Spirits. That Latex, because it is reduced, in a circle, its Vessels are in the whole passage proportionated as to the bulk of the Trunk and the branchings sent from it, to wit, so that the branches of the great Artery, being carried from the Heart, contain at the least so much of the blood, as the shoots reaching forth from them, into all the parts. But because the animal Spirits being once begotten and carried more outwardly, subsist longer there, and evaporate very slowly and by little and little; therefore the Vessels carrying them, *viz.* the Nerves, in respect of the Fibres receiving them, are made much lesser in proportion; lest perhaps by too great a supplement of the animal Spirits, and the too thick gathering of the fresh ones still into the nervous parts, the Army of the Veterans, before instructed, should be confounded, and so the orders of all being disturbed, the exercises of the animal Function should be performed any now. For indeed when at any time the Spirits are made too sharp, so that being therefore struck as it were with madness, they rush upon the nervous System with tumult and impetuosity; from hence a great unquietness and continual throwing about of the Members are wont to be excited, to which sometimes madness and fury succeed.

In the order and ordination of the animal Spirits, such as was but now described, the *Hypostasis* or the Essence of the sensitive Souls consists to wit, which is only a certain *Syltasis* or shadowy subsistence of those Spirits, which like Atoms or subtil Particles, being chained and abhering mutually one to another, are figured together in a certain Species. Moreover, the faculties of the same Soul depend upon the various *Metatbesis* and gesticulation of those Spirits within the aforesaid Organs of the Head and nervous System. But the consideration of this Soul and its powers requires a peculiar Tract, which hereafter (God willing) we intend; in the mean time, our Method demands of us, that (according to our weak skill) by the cense or numbering of the Nerves, being particularly made, we should deliver an exact Neurology or Doctrine of the Nerves.

But for that in the premised general consideration of the Nerves and Fibres, there was mention made of the nervous and nutritious Juyce; notwithstanding what belongs to their powers and natures, hath been neither fully nor clearly enough delivered; therefore we will a little divert here, and make it our business to inquire what sort of Juyces and Humors are carried into the parts of the animated body for their nourishment, and by what ways or passages: then this difficulty being removed, a plain and easie way leads into the Doctrine of the Nerves.

CHAP. XX.

Of the Nervous Liquor, and whether that or the bloody Humor be Nutritious;

SINCE the Circulation of the Blood was made known, and it hath been plainly made appear, that it did no where stagnate and stand still long, but was carried in a reciprocal motion, always as in a circle; it began to grow doubtful, whether its *Latex* is nutritious or not. For besides, that the more rapid course of the blood, as of a torrent, might seem to wear the banks which it flowed between, and to carry away some Particles from them, rather than to be able to affix any thing to them; the substance it self also of the blood, for that it is more torrid and uneven, is thought to be altogether unfit for nutrition. Wherefore that a Juyce may be found more convenient or fit for this office, the passages and hidden recesses of the Nerves are to be viewed; and as a certain *Latex* is found to flow within their Pores and passages, presently the blood being rejected, that nervous humor is gifted with the title of nutritious: but yet by what right, and after what manner nutrition is performed, shall be our present purpose to inquire.

And here first of all, that we may take the part of the blood, it will be easie to shew, that there is matter contained in it fit enough for the nourishment of the body, and a sufficient store of it. For besides the sulphureous substance of the blood, which within the fire place of the Heart, with a continual inkindling, and by that means deflagration in the Vessels produces life, and in the more perfect Animals heat, there is found also a certain other humor soft and alible, which in the Circulation, being distributed through several parts of the Body, by increasing them adds nourishment and bulk: yea the deflagration it self of the blood, plainly as a Kitchen-fire in dressing meat, as it were boils and prepares this humor, whereby it more easily is assimilated into the substance of every part to be nourished. Hence it comes to pass, that by reason of a defect of heat in the blood, no less than of excess, nutrition is often hindered. But that this kind of alible Juyce is contained in the blood mass, the *Anatomy* or spontaneous *Analysis* of its *Latex* sufficiently declares; for the extravasated blood, when it goes into parts of its own accord, this liquor being disjoyned from the purple thick part, and swimming a top of it, appears clear or limpid; but by reason of its more thick contents, to wit, the nutritious Particles, like the white of an Egg, it is easily made thick, and grows white by a gentle heat: which thing appears by this familiar Experiment, to wit, if you shall evaporate a little of it only in a Skillet over the fire, the whole liquor will presently grow together into a white Gelly. By this liquor, as the blood is more or less imbued with it, living Creatures grow and become more fleshy or lean: for both the blood of younger Animals being loosned from cold, is wont to shew much more of this kind of white than more ancient or older Creatures: and we may take notice daily at our Tables, that very much of this kind of Gelly comes out of the flesh of a Lamb or Calf being boiled or roasted, and nothing almost from Mutton or Beef, especially if old. Therefore we may lawfully suppose, that the blood is truly nourishable; and that the whole, or at least the greatest part of the matter, for the adding bulk or substance to every part, is dispensed from it: but if at any time it be defective in this its office, that happens not out of the natural unsuitness of it, but because its disposition is sometimes depraved, and as the Stomach labouring with some vice, rejects or perverts the Chyle to be cooked by it.

But the blood, as it is not the only and alone humor, which is distributed in the animated Body, so neither seems it able to perform alone and of it self the whole office of nutrition. For besides that, being diffused through the Arteries and Veins, another *Latex* is every where dispensed from the Head through the Nerves; which shall be shewn to afford something at least to nourishment.

As to the first, there are many reasons which declare that kind of humor to be in the Brain and nervous stock, and to abound in their whole passages. For unless the animal Spirits, continually flowing out, should be founded in such a *Latex*, which is their Vehicle, they would not be contiguous or joyned, nor able to continue and knit together the *Systasis* of the sensitive Soul. For if *Hippocrates* did observe long since, that Cramps and Convulsive motions were produced from driness and empriness, that perhaps might happen by this means: to wit, because humor in the Nerves or Fibres being deficient, the Spirits distracted one from another, were separated; which notwithstanding, that they might still retain their mutual embraces, and as it were folding of hands, bend the containing bodies, and very much contract, and so force them into Convulsions. Besides, Wounds and Impostumes of the Tendons and nervous part seem to witness the diffusion of the nervous Juyce, either of which drop forth a thin Ichor, and wholly unlike to the mere bloody Excretion: no less may be argued from the Ganglia and evil running Sores. In time of sleeping the aforesaid humor is wont to flow more plentifully into the Brain and Nerves, and to obstruct their passages; and therefore yawnings and stretchings come frequently upon those awaking, that its reliques might be shook off. Lastly, we might readily shew, that from the depravation of the

the nervous humor, Melancholy, Madnefs, and some wonderful Convulfive diftempers proceed. But it may be objected, that there is no fuch kind of humor, becaufe the Nerves being cut afunder, it is not perceived to flow out; and that the Nerves being alfo bound, they do not fwell above the Ligature, as Arteries and Veins. But it may be answered, That the liquor flowing in the nervous ftock, is very fubtil and fpirituouſ, and which, by any ſtriving or wrinkling up of thoſe parts, when they are roughly handled, may eaſily evaporate and be blown away or diſperſed unperceivably. Then further, tis obſerved in the Whelps of ſome Animals newly litter'd, who have as yet that juyce viſcous, and not eaſily to be diſperſed, and that have their Nerves greater, if they be bound hard together with cords they will fwell above the Ligature.

Therefore ſeeing it appears, that a certain Humor doth creep through the blind Pipes and paſſages of the Head and of the Appendix, both medullar and nervous, it behoves us next of all to inquire from whence that comes thither, and whither it tends; and laſtly, of what kind of nature and uſe it is. Concerning theſe firſt it appears, from what hath been ſaid, that the aforeſaid Latex, ſerving for a Vehicle of the animal Spirits, is perpetually inſtilled, together with them, from the blood watering the exterior confines of the Brain and Cerebel, which from thence, paſſing through the medullar Trunk, is afterwards, with a gentle ſpring, poured through the whole frame of the nervous Syſtem; ſo that the firſt fountains of the nervous humor are in the Brain and Cerebel. But further, to this Juyce conveying the forces of the animal Spirits, and ſupplied only from the Head, there joyns a certain other humor, as it were auxiliar in the whole paſſage, and reſtores and reſreſhes it otherwiſe about to grow deficient.

We think that theſe kind of ſupplements and ſubſidies, which happen to come from elſewhere to the nervous Juyce flowing from the Head, are received and addmitted inwardly from the ſides and extremities of the medullar and nervous Syſtem. We have already ſhewed that an humor, as it were ſecondary, is inſtilled from the blood watering theſe parts in its whole paſſage; becauſe the Arteries follow out only the medullar Trunk, but alſo the greater Trunks of the Nerves in many places, and inſert into them ſanguiferous ſhoots. Beſides, forasmuch as the animal Spirits flowing within the nervous ſtock for the performing of ſenſe and motion, tend to and fro, and ſo bear a double aſpect; it is probable alſo, that the liquor watering the Nerves, as it moſt commonly tends forward, ſo ſometimes backward; and ſo that the extremities of the Nerves, implanted in ſome parts, imbibe from them the humor, at leaſt ſome Effluvia's, with which they are ſatiſfied, and oftentimes transfer them into the Brain it ſelf. Certainly there is no doubt, that the Fibres and nervous Filaments or threads which cover the Senſory of taſte, and the *Viſcera* ſerving for Concoction, do immediately receive ſome taſtes of the taken in food, from which ſupplies are carried to the Brain it ſelf in great hunger and faintneſs of Spirits. Becauſe if at any time the Spirits inhabiting it, being exhauſted very much with heavy and long labour, begin to fail, a moſt ſwift reſection is performed, Peſtorals or Cordials being ſcarcely ſwallowed, and long indeed before the alible Juyce can be able to reach to the border of the Brain by the paſſage of the blood. Moreover it is moſt likely, that not only the benign Effluvia's of the aliment are received by the extremities of the Nerves ending about the *Viſcera*; but alſo by this way, that oftentimes an infeſtous matter, and in a manner malignant, is communicated by the Nerves and their paſſages to the Head. But indeed the preternatural Juyces heaped up about the Hypochondria, the Spleen, Womb, and other Bowels emit vaporous little bodies, which not only infect the bloody maſs, and diſtemper the Head by that means, but they climb to the Brain more immediately by the paſſage of the Nerves, and ſtrike it with an heavy ill. For from hence in part it comes, that Hypochondriacks and Hyſterical people are ſo cruelly puniſhed through the Symptoms ſtirred up in the Brain and nervous ſtock for the faults of the lower Bowels; hence it is, that little Pills of Opium, being ſcarcely diſſolved in the Stomach, cauſe a Torpor or heavineſs. But here is no place to diſcourſe more largely of theſe. It behoves us to conſider what remains, the Springs of the nervous Juyce, the Auxiliaries but now detected, and its Virtues and influences.

Concerning the nervous Liquor we ſhall inquire what that doth in its paſſage, to wit, whiſt it flows within the Marrows or middle of the Brain and Cerebel, the medullar Trunk and the bodies themſelves of the Nerves: ſecondly, then for what uſes it ſerves, when being ſliden from the ends of the Nerves, it is ſpread abroad on the ſecondary parts of the nervous Syſtem.

1. As to the firſt, whiſt that of the nervous Liquor paſſes through the Head, and either of its Appendix, its chief office ſeems to be for a Vehicle of the animal Spirits, which indeed it carries along with its diffuſion, and contains them under the ſame *Syſtaſis*. Yea, this Latex ſhews various Schemes of the Spirits for the performing of ſenſe and motion; even as the humid Particles of the Air paſs through the Optick Configurations of the Rays of Light. Alſo moreover, the nutrition of the aforeſaid part and accretion or growth into a bulk, depends in ſome meaſure upon the nervous Juyce watering the ſame, as ſhall be ſhewed by and by.

2. But the greateſt queſtion is concerning this Liquor being diffuſed beyond the ends of the Nerves upon the ſecondary parts of the nervous Syſtem, and in the paſſages of them on the whole Body; to wit, whether ſuch a Juyce be nourishing of all the ſolid parts, or of ſome of them by themſelves, as Authors variously think; or to what other office it is deſtinated.

Concerning these it first appears, that the Brain and Nerves, with the Juyce flowing out of them; contribute matter, or at least some influence to the work of nutrition; the which if it should chance to fail (a sign of which defect is, if the animal Faculty falters in part) the nourishment there is wont presently to be hindered or perverted. This is plainly seen in the Palsie, excited from an evident cause, without any previous Dyscrasie of the blood, where suddenly an Atrophy follows the privation of motion or sense, or of both together. Further, in the Scurvy, where the taint hath corrupted the nervous Juyce, when the sick begin to be afflicted with the Vertigo and swimming of the Head, and with wandering pains, Convulsions, and a frequent loosning of the Members, the flesh falls presently away, as in a Consumption, and without any fault of the Lungs, the sick wither away, as if distempered with a Phthisis. It is a vulgar observation, That from the immoderate use of *Venus*, also from an inveterate Gonorrhoea, from Strumous or running Ulcers, and other Impostumes, by which much of the nervous Juyce is wasted, a leanness or wasting of the whole Body is produced. Certainly, if I be not deceived, there are some Atrophies, yea, and sorts of breakings out, which seem to depend wholly upon the defect or the evil dispensation of the nervous Juyce, when the blood, as to its quantity and disposition, is not much in fault. Lastly, the consideration of some Diseases and Symptoms so plainly confirms the diffusion of the nervous Liquor and its great influence on all the parts, that there is even left no room for doubting.

Also no less doth the curing of some Diseases and the use of Remedies confirm the same. For from hence a reason is taken, wherefore Cephalick Plasters oftentimes yield such signal help in the *Phthisis*; not because they stay the *Catarrh* of the Serum falling down on the Lungs, (as the common people think) but because by corroborating the Brain they restore the disposition of the nervous Juyce, before vitiated. For this cause it is, that some diseases being stirred up by the fault of the nervous Liquor, of which sort among others are Cancrous and Strumous Ulcers, or such as come of the Kings-Evil, are hardest of all to be cured; because the morbid tincture of the Brain, and of the *Latex* watering it (whether it be innate or acquired) is not easily mended: yet sometimes when the root of the disease, lurking in the Brain or nervous stock, is taken away by the help of Nature it self, or by Chance, by the use of some remedy; presently the Symptoms of other parts, though neglected in the whole, vanish, not without the suspicion of a miracle. But how much the alteration of the Brain serves for the curing of some most grievous diseases, some instances taken from the Farriers Art will clearly shew.

For when many Medicines and Methods of Administrations are wont to be tryed in vain for the curing the stinking disease in Horses, commonly called the *Farcy* (which *Helmontius* asserts to be like the French Pox, and the author of its Contagion) the most certain means of curing (which I have very often known to be applied with good success) consists in this; that some sharp Medicines, of which sort are Heartsease, Water-Pepper, Ranunculus or Crowfoot, and the like, which very much abound in volatile Salt, being bruised into a mass, and put into the Ears of the diseased Horse, and kept there for twenty four hours: it is scarce credible by what means all the Ulcers are presently dried up, and the disease healed, as it were by Incantment, is quickly profligated in the whole. For since this Application is made far from the affected parts, without any alteration of the bowels or the blood, it should be so healed at a distance; certainly the cause of such an Energy must only be, that by this kind of Medicine the Dyscrasie or evil disposition of the Brain and nervous Juyce is taken away, and so the first root of the sickness being cut off, the shoots and fruits presently wither. It were worth our labour to try such kind of Experiments that also in our Medicines. Yea it may be well suspected, that such a way ought to be ordered for the common Cure of the Kings-Evil. Among our Country-men, as delivered from our Ancestors, it is thought the seventh Son, or he that is born the seventh one after another in a continued series, can cure this disease by stroking it only with his hand; and truly I have known many, whom no Medicines could help, to have been cured in a short time only by that remedy. Few doubt but that this disease is wont to be cured often by the Touch of our King. The reason of such an effect (if it be merely natural) ought to be assigned not to any other thing than that in the sick (especially those of ripe age) the Phantasie and strong Faith of the hoped for Cure induces that alteration, or rather strengthening to the Brain, whereby the morbid disposition radicated in it is profligated. But I shall return from whence I am digressed, to inquire what the nervous Juyce contributes to nutrition.

2. I say therefore secondly, although nutrition depends in some measure upon the influence of the nervous Juyce, yet it is highly improbable, that all the several parts of the whole Body should be nourished only by this provision. For besides that this, were to impose upon the Government of the Soul it self, and its primary Organs, the cooking office of nutrition wholly unworthy the excellency and dignity of those parts; it seems also that the nervous Liquor should be all together unfit for the administering to this Province: because when oftentimes immense expenses are made of the aliment to be assimilated into the substance of the solid parts, especially by immoderate sweat, also by continual labour and exercise, which Country-men and Labourers daily use, it is not possible that such losses should be repaired only by the nourishment supplied, or sent through the small passages of the Nerves.

When I had long and seriously considered with my self concerning this thing, what I at length thought, I shall tell you freely, and without any covering, or making any reflection, or blaming the Opinions of others. It seems first, that the nourishing matter of the whole Body is distributed into all parts from the blood through the Arteries; yet it may lawfully be thought, that the conversion of this matter into nutriment, and the assimilation of it into the substance of the part to be nourished, is performed by

the influence and help of the nervous Juyce, as it were of a certain spirituous Ferment. As to the first: we have already noted, that the sanguiferous Vessels do not only follow almost every where the Muscles and Bowels, but also the Head and its Appendix, yea the Membranes, Bones, and Nerves themselves, and affix to them all thick shoots, as so many little chanel, for the receiving the nourishment. Moreover, as there is a purple crassament or thick substance in the blood, whose substance stuffs and nourishes the Pores of the Parenchyma of the Muscles; so there is a whitish Gelly, by which the Membranes and the whiter parts seem to increase. Besides it may be observed, that the blood it self increasing, contains in it self fibres and small threads, such as are interwoven in the Muscles and nervous parts; and if the same stand long in any Vessel, it is presently coagulated into longish, white, and hard crusts or bits, whose substance is plainly fleshy; so that the blood produces flesh of it self, though the same be rude and unformed: wherefore the configuration and the apt disposition of the nourishing matter, supplied from it, depends on the coming and Energy of the nervous Juyce: but after what manner this is done, we shall endeavour now to shew.

After the web or stuff of all the parts is laid, it is required then that they be both drawn forth in due proportion, and grow in substance, and also that the little spaces which are left by reason of the Effluvia's perpetually falling off, may be continually filled with the nourishing substance cast in. In these two things the business of nutrition chiefly consists; for the performing of either of which the blood affords matter, and reaches it forth (as was said) in the circulating to the several parts of the concrete, and as it were stands at the doors of the part to be nourished: yet, that this matter may be rightly disposed, and its particles, to wit, the thick and thin, saline and sulphureous, and others of a several nature, separated one from another, may be employed with some choice to the destined uses, there seems need of a certain directing faculty, and as it were plastick virtue, got somewhere else than from the blood it self. For indeed the blood being destitute of animal Spirits, is unfit for the performing these offices. Wherefore, for that it appears there doth lye hid in the nervous stock, a certain juyce, and the same being gifted with animal Spirits to be diffused to all parts, how can we suppose less but that this subtil and spirituous Liquor, every where meeting with the arterious which is duller and thicker, actuates and inspires it, and as it were ordains it for the performing the designed work of nutrition? especially when it plainly appears, that by reason of the defect or depravation of this nervous Juyce, nutrition is always frustrated or perverted.

Therefore it may be lawful, in the difficult Controversie concerning the Matter and Method of Cure, to propose this our Hypothesis, though it be a Paradox and very abstruse; to wit, that the nervous Juyce (which we have said was like the male seed) is poured out with the nutritious humor copiously suggested from the Arteries, as it were the genitive or seed of another Sex, every where upon all the parts; and that this former, being indued with active Elements, imbues the more thick matter, as with a certain Ferment, and impregnates it with animal Spirit; and when it so makes it, with a mutual entering in or coming together, to be dissolved and to go into parts, its particles being extricated one from the other (the Spirit infused helping) they are put upon bodies of the same measure with themselves, and are assimilated into their substances. In the mean time, because the animal Spirits are poured out in great plenty with the nervous Juyce, those which are at leisure from the work of nutrition, or remain after that is finished, turn aside every where into the Fibres, as into proper dwelling-houses, and there being ready for the offices of sense and motion, stay; which offices indeed, that those Spirits the Inhabitants of the Fibers, may the better perform, they acquire from the blood watering the Muscles, certain auxiliary forces, wherefore they being endued with a certain elastick force, are apt to be highly rarified and as it were exploded.

But indeed we suppose, that as the nervous Liquor, being turgid with animal Spirit, causes the arterious humor to become nutritious; so in compensation of this the animal Spirits remaining of the work of nutrition, and every where disposed within the Fibres, receive from the arterious blood a mixture or certain Copula; by whose help and cooperation the same Spirits exert or put forth much more strongly their locomotive force. For it seems that little sulphureous bodies are added to the spirituous-saline particles from the watering blood; and so when the animal Spirits are furnished with this Copula, they being stirred up into motion, shake off the borrowed particles, which being struck with a certain force, like the explosion of Gun-powder, suddenly intumesc the Muscles, and so by contracting them very much, they cause a vehement motive endeavour. We shall have an occasion of discoursing more at large of this, when we treat of the Motion of the Muscles.

Yet in the mean time, we shall take notice, that the Muscles of the whole Body, as to their motion, have a certain Analogy with the motion of the Heart. For indeed the animal Spirits in the Heart, flowing within the fibres and nervous threads, (with which this part is much beset) receive plentifully sulphureous little bodies from the inflowing blood distending the sides of either bosom, which whilst the same Spirits, being filled to a fulness, shake off and as it were explode, a *Systole* of the whole Heart (its sides being carried with a certain force inwards) is brought in or caused, whereby the blood, from either side the bosom is cast out as it were by the impulse of a Spring or Bolt. Truly, unless the Spirits inhabiting the Heart, should receive food and matter of explosion from the blood it self, their stock, supplied or sent by the passage of the few and small Nerves, would not suffice for the performing of the undisturbed motion. A sign of this is, that from a defect or depravation of the blood, as well as of the animal Spirits,

Spirits, the motion also of the Heart is defective or diminished. And not much unlike in the Muscles, as in the Heart, is the business performed; the Spirits inhabiting their Fibres, receive a sulphureous Copula and apt for explosion, from the blood there more plentifully flowing than about the Membranes, with which being endued, as often as they receive from the Nerve as it were the fiery inkindling or the match, the instinct of the motion to be performed, they being excited, and striking off their Copula, very much inflame or blow up the Muscle, and intumesc it for performing or compassing the motive endeavour. Nor is it much to purpose, or makes any great difference, that the motion of the Heart, stirred up by a perpetual instinct, is found always necessary; but the Muscles the most of them only occasionally and at the command of the Animal, do put forth their motive power; for the *Diaphragma* and some Muscles, dedicated to Respiration, are urged with a perpetual *Systole* and *Diastole*, as well as the Heart itself.

From the aforesaid Hypothesis concerning the offices and uses of the nervous and arterious Juyce, Arguments that otherwise determine the work of Nutrition, may be easily answered. For that the blood is said rather to prey upon the solid parts than to replenish them, that ought to be attributed to the Disease and Dyscrasie of it, and not to it simply: because sometimes the blood is accused, for that it too much stuffs the solid parts; to wit, forasmuch as its mass being waterish and weak, it lays aside the alible Juyce (which not being truly cook'd, is still crude and vicious) with very great plenty about the habit of the Body, and so induces an *Anasarca*. In the mean time it ought to be granted, That as it is the blood that is evil which heaps up too much vicious nutriment; so it is the same, which being well and right, doth laudably perform the office of Nutrition.

But that it is argued, That the nervous is rather the nourishing Juyce, because by reason of its defect, depravation or too prodigal expence, the acts of nutrition are wont to be hindred or perverted; it is easy to reply to this, That the impediments of the nervous Juyce, being made vicious, respect the form of nourishment, and not the matter of it: to wit, it sometimes happens, that the blood dispenses the alible matter in due plenty and disposition; which notwithstanding, by the fault of the nervous Juyce, is not rightly assimilated. When an impotency of motion comes upon a too great distension of the Muscle or Tendon with pain, shortly nutrition being hindred, a Jelly grows about the distempered part: which notwithstanding drops not out of the Nerve (as is commonly said) but the glutinous humor being poured out of the Arteries for aliment, for that it cannot be received by the hurt part, is gathered together there: nor is it to be thought, that Tumors, or Strumous Ulcers or the running Sores of the Evil do contain or pour out only a nervous humor, since the matter of either is for the most part bloody, which by reason of the evil Ferment of the nervous Juyce, puts on a strange form, and that diversly degenerate.

This supposition of the twofold Humor, for the matter and form of nourishment, is taken to be of egregious use for the solving of the most difficult *Phænomena*, which are met with about the Distempers of the Brain and nervous Juyce: yea that Pathology, seriously considered, seems to infer as a certain necessary consequence, that a twofold Juyce is necessary for the work of nutrition; as some other time perhaps we may shew. In the mean time, leaving this Speculation, we shall proceed to the remaining Task of our *Anatomy*, to wit, the *Neurologie* or of the *Nerves* in particular.

T H E

Description and Use

O F T H E

N E R V E S.

C H A P. XXI.

The first four Pair of Nerves arising within the Skull are described.

TH E division or distinction of the Nerves, by reason of their various respects, is wont to be manifold : to wit, as they are either soft or hard, singular or numerous in their beginnings ; or that they serve either to the faculty of Sense or Motion, or to both together. But they are commonly distinguished, That some Nerves arising within the Skull, proceed from the *oblong Marrow* ; and others going out of the joynts of the *Vertebra*, are derived from the *spinal Marrow*. But besides these, another manner of differencing them seems best to us ; to wit, That some Nerves, as it were Clients and Servants of the Brain, perform only spontaneous Acts, and others, Ministers and Servants of the Cerebel, are employed only about the exercises of the Involuntary Function. There will be no need to assign different Essences or Constitutions of Nerves according to these several differences : but rather that there be instituted a particular Cense or Muster of them, and following the order of Nature, that we especially unfold every one of them in the series in which they are disposed in the animal Body.

Among the Nerves arising from the Skull, the smelling Nerves, or those which are commonly called the Mammillary Processes, lead the way ; for that they have their rise before all the rest, and are stretched out forward beyond the Brain it self. These Nerves go out of the shanks of the oblong Marrow within the chamfered bodies and chambers of the Optick Nerves ; and being endued with a manifest cavity, open into the first Ventricle of the Brain on either side behind the same chamfered bodies ; so that the humidity flowing between the folding of the Brain, is carried through these chanel into the mammillary Processes ; whether they go farther forward, shall be anon inquired into : Because these Nerves being broad and large, arising near the chamfered bodies, and from thence stretched forward under the Basis of the Brain, their bulk is increased by degrees till they go into the round Processes like Paps, by which either bosom of the Cribrous or Sieve-like Bone is besmeared. Within the Socket of this Bone these Nerves, as yet soft and tender, obtain Coats of the *Dura Mater* ; with which being divided into many fibres and filaments, and passing through the holes of the Sieve-like Bone, they go out of the Skull : from whence being dilated or carried forward into the caverns of the Nostrils, and distributed on every side, they are inserted into the Membrane bespredding those Labyrinths.

If we enquire into the nature and use of these parts, without doubt the mammillary Processes and their medullar roots, with the fibres and small thread hanging to the same, are truly Nerves, and serve properly for the very Organ of the Smell. Seeing these conduce to the sense only without any local motion, therefore (even as the other hearing Nerve) whilst they are within the Skull, they are plainly medullar and soft ; whereby the Animal Spirits more easily moved within the more tender substance of the Nerves,

Nerves might convey more readily and accurately to the common Sensory the Ideas or Forms of the sensible Species: But because the Effluvi's or odorous breaths to be received by the naked Organ, carry oftentimes with them sharp and pricking Particles hurtful to the Brain and Nerves; therefore in the first course these Nerves being about to go out of the Skull, borrow Coats from the *Dura Mater*, which serve for Armour. Further, as these breaths (lest they should strike more sharply by rushing impetuously on the Sensory) being admitted only by little and little, and by small bands, ought to be brought through divers narrow turnings and windings of the Nostrils; therefore that these Nerves may the better receive the effluvia's flowing within the several dens, they are so divided into very many fibres and small threads or filaments, that there may be no passage of the Nostrils to which at least some of them are not destinated. And after this manner, although the exhalations, as it were torn into little Clouds, are received by the nervous filaments, and so care is sufficiently taken, that they being more thickly elevated, may not overwhelm or obscure the Sensory; yet lest any thing sharp and troublesome should be carried with them to the Brain, the cribrous bone is set before the doors as an obstacle, through whose little holes being strained, they may put off all sharpness. And lastly, they being carried through the softer Nerve, as it were another Medium, and so broken again, they at length being soft and gentle enough, are staid at the first Sensory.

But that these Nerves are noted through the whole with an open hollowness within the Skull, the reason seems to be, that the watry humor stilling out of the foldings of the Brain, and being derived into those chanel's, might beat back and temper the impressions of the odours, when too sharp and fiery; for as the humors included in the Eye, variously refract the visible Species, whereby it passing at last through the Optick Nerve without any force, slides pleasantly to the common Sensory; so it is not improbable, that the water contained within these passages of the Nerves, does in like manner sweeten the species of the odours, and prepare them in some measure for the Sensory. Wherefore it is observed, that Cattle and Beasts which are fed with herbage, have the mammillary Processes exceeding large and always full of water; to wit, lest the odours of the herbs continually attracted by them (unless their force should be blunted after the aforesaid manner) might hurt or overthrow their more weak brain. Besides, it is very likely that this watry juyce falling down from the infolding of the Brain, doth not only flow into the open chanel's of the Nerves and the mammillary Processes, but also doth pass through by the passage of the fibres and filaments the holes of the Sieve-like bone; and doth wet and continually moisten the cavities of the Nostrils, apt to be dried or torried too much by the Air thither attracted, and by the breath continually blown out. For it clearly appears, as we have elsewhere shewn, that the serous humors creep through the blind passages of the Nerves and Fibres, and by them wander from place to place. Yea it may be thought, that not only water, sufficient for the watering the Nostrils, doth by this way sweat through; but also whensoever the serous heap is gathered together in the Ventricles of the Brain, its superfluities or the excrementitious humor doth very often pass through the cribrous Bone by the passage of the Fibres, and is sent out. But we have in another place discoursed more largely of this.

The smelling Nerves, which have within the Skull their mammillary Processes depending on them, are much greater in an Ox, Goat, and in Cattle, and such like beasts that live on herbage, than in flesh-eating Animals; to wit, because in those there seems to be more need of the sense of smelling to be more exquisite for the knowing the virtues of the manifold herbs. Also these Nerves are larger in all Brutes than in Man: the reason of which is, because they discern things only by the sense, and especially their food by the smell; but Man learns many things by education or nurture and discourse, and is rather led by the taste and sight, than by the smell in chusing his aliments. These Nerves in Birds, as also in Fishes, are conspicuous enough; for either of these, even as four-footed beasts seek out and chuse their food by the help or knowledge of the smell.

As to the Fibres and Filaments or little strings stretching out from the more soft Nerves through the holes of the Sieve-like Bone into the caverns of the Nose, these are found in all Creatures who have the mammillary Processes: so that it is not to be doubted, but that these Processes, with this Appendix and its medullary origine, is the Organ of the Smell. And what more confirms this thing, these filaments or little strings are far more, and more remarkable in hunting Hounds than in any other Animal whatsoever. But besides these Nervulets drawn through the holes of the Sieve-like Bone into the Nostrils, two branches also are sent hither from the fifth pair, and distributed into both the Nostrils. The reason of this seems to be, because though the Nerves but now described, or of the first Conjugation, are properly smelling Nerves, and effect by themselves the sense of Smelling; yet these are assisted or joyned with other Nerves, also by those sent from the fifth pair, because the Organ of the Smell ought to have a consent with all other parts, which those subsidiary Nerves, by reason of the manifold branching out of the fifth pair, are wont to perform. It chiefly appears, that there is a certain nearness or strict affinity between the taste and the smell: and the cause of this consists, in that out of the same Trunk of the fifth pair certain Nerves are sent to the Palate, and others to the Nostrils. Concerning the reason of that wonderful consent which the Nostrils have with the *Precordia* in sneezing, also wherefore that light titillation stirs up a Cough, shall be spoken of hereafter; when we come to unfold the fifth pair and the intercostal Nerves. But in the mean time we shall take notice, that although many Nerves belong to the Organ of Smelling, yet that sense is properly performed by the Fibres interwoven in the inward Coat of the Nostrils: for those Fibres being struck by the sensible object, move and contract themselves variously according to the Idea of the

impression; which Affection of them being carried by the passage of the *Nerves* to the Head, so far as much as it is there staid by the common Sensory, causes the perception of the sense. Those sensible Fibres are diversly figured in several Animals; which is the reason, why odorous things do not alike affect all Animals. For what things by a mans nostrils, as endued with too sharp and pricking Effluvia's, are esteemed highly naught and stinking, as especially are dung and putrid flesh; the same are to Dogs, whose Organ of Smelling is made or consists of more robust or strong Fibres, and proportionate to those Effluvia's, as very grateful and chosen for food.

The second Conjugation are the Optick or seeing Nerves: concerning which we have shewn already, in the *Anatomy of the Brain*, after what manner they arise from behind the chamfered bodies out of the second section of the medullar shanks (which *Galen* calls the *Chamber of the Optick Nerve*) and descending from thence with a certain compass are united, and being again separated and carried into the Ball of the Eyes, constitute with diffused Fibres the hard Coat. Moreover, in those Observations we did but now take notice, that the Trunk of this *Nerve* growing a little hard without the Skull, was as it were a little bundle of very many Fibres or small strings growing together into one, and of produced Parallels, as it should seem for that end, that the animal Spirits, flowing in the whole *Nerve*, might be moved in so many lines or direct rays; to wit, whereby they may carry the visible Species, sufficiently refracted in the Eye, thence to the common Sensory by a direct beam, and not intorted or rolled about.

As often as in the distempers of the Eyes blackish pricks or concatenated pieces of any thing seem to be rolled before the Eyes, it is likely that this apparition is so made, because certain filaments or small strings of the *Optick Nerve* are shut up, which when the light cannot pass through rightly, as through the rest, so many as it were shadowy spaces appear in the middle of the clearness. These Nerves, because they only serve for the sense, are therefore more soft within the Skull: but, because there may be need perhaps, that the Trunk of this *Nerve* ought to be sometimes dilated or spread abroad, sometimes bound close together or contracted according to the divers appearance and incourse of the objects; therefore very many Fibres, being sent out from the motory or moving *Nerves* of the Eyes, do every where compass and bind it about, and entering with it into the Ball of the Eye, are inserted partly near the root of the *Optick Nerve*, and partly penetrate more deeply the Sclerotick or hard Coat it self.

Further, the *Optick Nerves* are not only bound or environed with nervous Fibres sent from the third pair, but (as we have shewn above) with sanguiferous Vessels in their whole process. The office of which certainly is, both that there might be every where about the greater Trunk of this *Nerve*, as it were a continual heat or sufficient fire-place; also perhaps, that the food of the bloody humor might be supplied to the Spirits, living there within the Trunks of the *Nerves*, far from the fountain, as is wont to be in other places.

Concerning the Fabrick of the Eye it self, and manner of seeing, also concerning the whole dioptrick provision, here seems a fit opportunity of discoursing: but this were to digress too far from our purpose, to wit, the mere or naked Doctrine of the *Nerves*; and I may the better pass by this addition, because this Province hath been sufficiently and accurately adorned by others. In the mean time we shall take notice, that as in the smelling, so also in seeing, the sense is performed, not so much by the help of the nerve, as of the fibres, which are interwoven with the organ: to wit, the little fibres in the Membranes of the Eyes, and especially those inserted into the Sclerotick Coat, and disposed after the manner of a Net, do receive the impression of the visible Species, and by representing the image of the thing, so as it is offered without, causes sight. But it is the office of the Nerve it self to transmit inwardly, as it were by the passage of the Optick Pipe, that image or sensible Species, and to carry it to the common Sensory.

The third Conjugation of Nerves are the moving *Nerves* of the Eyes, which arise in the Basis of the medullar Stem behind the Tunnel; from whence going forwards nigh the pair of seeing Nerves, and going out of the Skull with the other *Nerves* destinated to the Eye, they are carried towards the Globe of the Eye; where being presently divided into many branches, they provide it with moving Muscles; but with various difference in divers living Creatures. For in an Ox, who hath got a larger Eye, the moving Nerve of the Eye imparts a branch to every one of the six common Muscles; and besides, from the Nerves of the fourth, fifth and sixth pair certain branches are distributed to some of the same Muscles: so that, as often as any Animal intends or applies the sense for the perceiving of this or that object, these Nerves turn about the Eye, and compose it at their pleasure for the spontaneous beholding of the same. Besides we take notice, that the Eyes do get a diverse kind of involuntary motion; because in Fear, Shame, Anger, Sadness, yea and in all Affections of the Head and Heart, whether we will or no, the Eyes are respectively figured. Wherefore 'tis highly probable, that these kind of pathetick motions of the Eyes, whereof the living Creature is scarce knowing, are performed by the help of the other nerves, to wit, of those coming from the fourth, fifth, and sixth pair: and that more manifestly appears, because the same nerves which lend their branches to the Eye, take their origines from the Cerebel, the office of which we have often shewn to be, to dispense the Spirits for the exercise of the involuntary Function.

But concerning these Nerves of the third pair, which are properly called the Moving nerves of the Eyes, we observe, that in Man, a Dog, and in some other living Creatures they are found to be somewhat otherwise than in an Ox: for either nerve in these, as in the rest, is carried out of the Skull, divided into four branches, three of which are carried from thence into three straight distinct Muscles, to wit, one

lifting

lifting up, the other bringing together, the third pressing close the Eye; the other branch of it goes forwards further with a single trunk, and is implanted in the middle of the Muscle going about the Eye, turning obliquely to the inward corner downwards. From these it appears, that these Muscles, to which this nerve belongs in all, are sufficient almost of themselves to perform most spontaneous motions of the Eye: but where the afore said nerve is divided into four shoots, it constitutes a small and round infolding, out of which many small shoots creep through, and variously compass about the trunk of the Optick nerve; for what use it is so made, we have already intimated.

The fourth Conjugation of Nerves (which we call rightly the Fourth by order and succession, although it is accounted the eighth and last by *Fallopins*) hath a diverse origine from all the rest. For whereas most of the others proceed from the foot or sides of the oblong Marrow, this hath its root in the top of it behind the round Protuberances, called *Nates* and *Testes*: from whence, bending more forward nigh the sides of the oblong Marrow, it is presently hid under the *Dura Mater*: under which going along for some space, and passing through the Skull at the same hole with the rest destined to the Eye, it is bestowed with a single trunk, not communicating with any of the other Nerves, wholly on the Muscle called the Trochlean Muscle. Above we called these Nerves the Pathetick Nerves of the Eyes: for although some besides may deserve this name, (as shall be shewn by and by) yet 'tis most likely, that the proper office of these is to move the Eyes pathetically, according to the force of the Passions and instinct of Nature, delivered and remanded from the Brain to the Cerebel, and so on the contrary, from this to that through the *Nates* and *Testes*, and their medullar Processes. For, as we have shewn, that by the diverse impulse and waving of the animal spirits dwelling in this by-path, there are instituted certain mutual commerces between the Brain and the *Præcordia*, (the Cerebel mediating between either) it will be of necessity, that these Nerves, rooted in the middle way, should be struck by every tending downwards or remove of the Spirits, going this way or that way, and so the motions of the Eyes to follow the affections of those parts. All perfect Animals are furnished with these nerves: and in truth, as none of them but are obnoxious to Anger, Love, Hatred, and other Affections, so every little Creature shew these by the mere aspect and by the gesture itself of the Eyes. We see sometimes the greater Pike gaping for his prey first of all to roll about his eyes, and to look four; then with a swift shooting out of his body to invade the lesser fry of fish.

CHAP. XXII.

The fifth, sixth, and seventh Pair of Nerves are unfolded.

OF the afore said four Pair of Nerves, the two former seem chiefly to serve for the Sense only, but the two latter for Motion; and every single Nerve of them destined to a peculiar Province: but this which follows next, to wit, the fifth Conjugation of Nerves serves for the exercise of either Faculty, to wit, both of Sense and Motion; nor is its Province so strictly bounded, that it should belong only to one member, for it is distributed to the Eyes, Nose and Palate, and the rest of the parts of the Face, and besides, helps in its part in some sort the offices and actions of the *Præcordia* and almost of all the *Viscera*.

This pair (which by the Ancients was accounted the third, by us the fifth pair, and that by right of order or position) below the former nerves, proceeds with a broad and large trunk from the sides of the annular Protuberance or Process sent out from the Cerebel. It consists of very many Fibres gathered together, some of which are soft, others hard; so that the great trunk of it near its beginning, is nothing else than a little bundle of very many nerves, some of which are bestowed on these parts, and others on other parts, and in some they perform the offices of motion, in others of sense. But that so many nerves being destined to so many several members, and remote one from another, yet arising together, are collected as it were into one bundle, the reason is, that in all the parts to which those Nerves belong, a certain Sympathy and consent of actions might be conserved: to wit, the communion of those Nerves is the cause why the sight and smell move spittle and please the Palate; nor by any other means are the *Præcordia* affected, according to the various conceptions of the Brain, and transmit their affections to the several parts of the Face; from whence the aspect or countenance of the whole Animal is pathetically figured, as shall be shewed more particularly below.

In the mean time, let us deliver a short Hypotype or Figure of this Nerve; its trunk going out of the sides of the greater Ring, sometimes near its beginning, but oftner the *Dura Mater* being first perforated or passed through, is divided into two noted branches. The first of these tending straight downward, going out of the Skull at a proper hole, in its descent towards the lower Jaw, (to whose parts it is chiefly destined) is divided into more branches, with which it furnishes the Temple-muscle, also the Muscles of the Face and Cheeks. Moreover, from them shoots and branches are distributed into

into the Lips, Gums, roots of the Teeth, Jaws, Throat, the farther end of the Palate, yea and the Tongue; for this reason chiefly, that the Nerves going out of the lower branch of the fifth pair, might effect, besides sense, the divers offices of Taste and Touch or Feeling, and motions of a various kind in the aforesaid members and parts; most of which, as the chewing of the aliment, also those which have respect to configuration or framing of the mouth and face in laughing or weeping (as we have already noted) are performed unknown to the Brain, that is involuntarily, and by the help of the Cerebellum only, from which these Nerves are derived.

The other superior, and also the greater branch of the fifth pair under the *Dura Mater* nigh the side of the Turkey Chair goes straight forward for a little space, and is enlarged into some shoots over against the pituitary Glandula to the trunk of the Carotick Artery or the wonderful Net, (where it is present) then it is inoculated into the Nerve of the sixth pair, and from thence sends back sometimes one, sometimes two shoots; which being united with another shoot, turned back from the Nerve of the sixth pair, constitute the root or first trunk of the intercostal Nerve. Concerning this intercostal Nerve, which is made of the lower ramification or branching out of the Nerves of the fifth and sixth pair, it shall be spoken of particularly hereafter.

Presently after the branches or shoots reflected or bent back for the root of the intercostal Nerve, that greater Nerve of the fifth pair is divided into two noted branches. The lesser and uppermost of these tending towards the globe of the Eye, and becoming again twofold, sends forth two branches from it self; one of which turning towards the inward side of the Bone, containing the ball or angle of the Eye, is divided into two shoots. The other of these having passed through the Bone nigh the mammillary Processes, is carried into the nostrils: the office of this Nerve is to keep a Sympathy and consent of action between the Nostrils and some other parts: but the other branch of this division is bestowed on the Muscle by which Brutes wink.

The second Ophthalmick branch of the fifth pair is divided into four or five shoots, all which going forward above the Muscles of the Eye, and in some part passing through its Glandula's, are almost all lost in the Eye-brows, unless that in the passage they send down two small shoots which enter the *Sclerotick* Coat a little below the Tendons of the Muscles, and reach to the *Uvea*, or the fourth thin Membrane that cloaths the Optick Nerve; yea and also send in the passage small shoots to the Glandula's of the Eye. It seems that these Nerves of the fifth pair, being distributed into the Glandula's of the Eyes and Eye-brows, serve chiefly to the involuntary and pathetick actions of those parts; the chief of which are, the languishing and mournful aspect of the Eyes in weeping, and the unwilling pouring out of tears. For as the lower branching of the fifth pair, to wit, the intercostal nerve, provideth in man for the *Præcordia*, it easily happens, that from the sad affection of these, the Cardiac branches of this Nerve being forced and wrinkled into Convulsions, the aforesaid Ophthalmick branches also so correspond, and by wrinkling the Eye-brows, and by compressing the Glandula's, produce those kind of looks of the Eyes, and marks of sorrow and grief. Further it is observed, that from the Ophthalmick branch of the fifth pair a certain shoot is sent back higher nigh the heads of the Muscles; which when it has passed through at a proper hole, the Bone containing the ball of the Eye, is carried straight into the caverns of the Nostrils. Hence, as I think, a reason may be given, wherefore passing out of a dark place into the light, at the first beholding of the Sun, presently whether we will or no we shall sneeze; to wit, the eyes being too strongly struck by the object, and being suddenly and disorderly moved, that they might turn themselves aside, the same affection is immediately communicated through the aforesaid Nerve to the Membrane covering the hollow caverns of the Nostrils, which being thence contracted and wrinkled, (as it is wont by some sharp thing pulling it) provokes sneezing.

The second or greater branch of the second division of the Nerve of the fifth pair being carried nigh the ball of the Eye, is again divided into two branches. The lower of these being bent downwards, cleaving into many shoots, is bestowed on the Palate and upper Region of the Jaws: The other and higher branch of this second division stretching beyond the ball of the Eye, passes through, together with the Vein and Artery, a proper hole made in the bone of the upper Jaw; which Vessels this Nerve climbs and variously compasses about with many shoots sent forth; then arising out of the bone, it imparts little branches to the Muscles of the Cheeks, Lips, Nose, and to the roots of the upper Teeth. Therefore forasmuch as this Nerve embraces and binds about the sanguiferous Vessels destinated to the Cheeks and the other parts of the Face; from hence a reason may be given, why the face is covered with blushing by shame: for the animal Spirits being disturbed by the imagination of an unseemly thing, by and by endeavouring as it were to hide the face, their irregularities enter this Nerve, so that the shoots of the same Nerve, embracing the blood-carrying Vessels, by compressing and pulling the same, cause the blood to be more forced into the Cheeks and Face, and the Veins being bound hard to be there for some time staid and detained. But forasmuch as many shoots and fibres of the same maxillar Nerve, derived from the fifth pair, interweave themselves with the flesh and skin of the Lips, hence the reason is plain, why these parts are so very sensible, and besides, why the mutual kisses of Lovers, impressed on the Lips, so easily irritate love and lust by affecting both the *Præcordia* and Genitals; to wit, because the lower branching of the same fifth pair actuates these parts constituted in the middle and lower Belly, and draws them into the like affection with the Lips. The same reason holds of Love presently admitted by the eyes, that as the Poet says,

Mars videt hanc; visamq; cupit.

As soon as Mars saw her, he desir'd her.

We

We have but now intimated, that many shoots of this Nerve were destinated for the business of chewing; and therefore, because the aliments to be taken ought to undergo not only the examination of the taste, but also of the smell and sight, from the same Nerve, whose branches being sent to the Palate and Jaws, perform the business of chewing, other shoots, as it were fore-runners, are carried to the Nostrils and Eyes, to wit, that these Organs of the other Senses might be furnished with some helps of probation also, for the better knowing or distinguishing the objects of taste. Certainly from the nearness of kindred and manifold affinity of this Nerve, being also much diffused in the Head, the mutual dependencies and confederations of very many of its parts, proceed. But how this Nerve in other Provinces, to wit, in the *Thorax* and lower belly, and there about the motions and sensations of the *Precordia* and *Viscera*, doth cause various Sympathies of them among themselves and with other parts, shall afterwards be more largely shewn, when we shall speak particularly of the intercostal Nerve, which is rooted in this Nerve of the fifth pair; where, from the manifold communication of this Nerve, may be easily drawn the reasons of sneezing, yawning, laughing, crying, and of other actions merely natural. In the mean time, the superior branching of the Nerve of the fifth pair shews it self after this manner in the Head, and almost after the same manner is divaricated in most living Creatures; except however, that in some presently after its rise, it is divided into three great branches; one of which is destinated to the lower Jaw, the other to the Eye and Nose, and the third to the Cheek.

The Nerve of the sixth Conjugation follows, which arising out of the lowest foot of the annular Protuberance, and being hid under the *Dura Mater*: presently goes out of the Skull at the same hole with the nerves of the third and fourth pair, and is carried with a single Trunk into the ball of the Eye; but so, that near the side of the Turkey Chair it is inoculated with the second branch, or the greater of the fifth pair; from whence it turns back, sometimes one little branch, sometimes two; which being united with the branches of the fifth pair running back, constitute the beginning of the intercostal nerve. Then this nerve going forwards, is divided into two branches near the ball of the Eye; one of which is inserted into the Muscle drawing back the Eye planted in its outward angle; and the other being torn into various fibres, is bestowed on the seventh Muscle proper to Brutes; so that this nerve also seems to serve to those motions of the Eye that are almost only pathetick, or excited by natural Instinct. For, as to the use of the former shoot, it plainly appears, that it is innate to every Animal in a sudden fear to draw the eyes backward, and to look for what is to be feared on either side and behind: then as to its other shoot, whereby Brutes winkle or twinkle the eye, it is obvious that this same motion is sudden and extemporary, without any previous intention, whereby the eye endeavours to shun the injuries of outward things that occur.

The seventh Conjugation of Nerves, accounted for the fifth by the Ancients, is employed about the sense of hearing. Of this pair commonly are noted two Processes, the one soft, the other hard; which indeed seem to be two distinct nerves, for that although they have their beginnings nigh one another, yet are somewhat distinct, and are carried to divers Organs; in the mean time either agreeing in a certain common respect of use or action. For whilst one Nerve performs the act of hearing, the other supplies some requisites whereby that act may be the better performed: wherefore we shall not much strive against the common description of this pair, by which it is taken for one. The process of this pair, or the auditory Nerve properly, which is called the soft Branch, seems to arise in man out of the lower side of the ringy Protuberance, and in beasts out of the midst of the lesser Ring. In some Dissections I plainly found, that this softer Nerve, having its beginning lower, seemed to ascend a little before it went out of the medullar stock; and the other more hard Nerve seeming to arise higher (*viz.* out of the medullar whitish line leading about the bottom of the fourth Ventricle) did descend a little, and arose near the meeting with the other. This softer Nerve is carried into the passage of the stony Bone, where entering into the den destinated for the receiving the sound, which is on this side the Snail-like winding and the Drum, it so infolds it self into the most thin Membrane wherewith that den is covered, that as often as the Air implanted in that cavern is moved by the stroke of the external Air made upon the Drum, this impression striking this Membrane, and stirring up as it were an undulation of the animal Spirits, is forthwith carried towards the common Sensory by the passage of the Nerve there implanted. There will be a more opportune place of discoursing, after what manner, and by what sort of Organs Hearing is performed, when we shall speak of the Senses.

The other Nerve of this pair, or the more hard process, which conduces rather to motion than sense, passing through the stony Bone at an hole proper to it self, arises near the auditory passage, where it presently receives into its trunk a branch from the wandering pair brought thither; then immediately after that joining together or coalition, it is divided into two branches: The first of these tending downwards, is bestowed upon the Muscles of the Tongue and the Bone *Hyoides*; the other going about the auditory passage, and bending more upwards, is divided into three shoots; the first of which, answering to the Nerve of the former division, bestows some shoots on the Muscles of the Lips, Mouth, Face, and Nostrils, and so actuates some exterior Organs for the forming the voice, as the former doth some interior Organs. The second shoot of this division distributes its shoots into the Muscles of the Eyebrows and

and Forehead; and the third into the Muscles of the Ear it self. The offices and uses of all these have been already shewn, the sum of which is, that as often as the sound is admitted in, especially if it be any ways unusual, new, or to be wondred at, presently by a certain natural instinct the Ears and Eyes erect and open themselves: to wit, for that end shoots from this Nerve are inserted into the Muscles of the Eye-lids and Ears, that by the passage of these, the Spirits inhabiting either Region, might be called out as it were to watch. For a like reason shoots from the same hard process of this Nerve are distributed both into the Muscles of the Tongue and of the Bone *Hyoides*: as also into those of the Lips and the outward parts of the Mouth, that by their passage, the sound being transmitted further to these Organs of the voice, it being equal or like the same, might officiously answer it as it were an Echo. That the descriptions of the aforesaid Nerves might be better understood, I have thought good here to represent in the following Figure the branchings of the fifth and sixth pair. The seventh pair is fitly delineated in the ninth Figure.

This Figure shews the Branchings of the fifth and sixth pair of Nerves.

- A. The Nerve of the sixth pair (which we place first, because it is outmost in the Scheme) from whose trunk two shoots a. a. are carried into the two Muscles of the Eye.
- A. A shoot from the Nerve of the sixth pair bent back for the root of the intercostal Nerve.
- B. The trunk of the fifth pair being presently divided into two great branches:
- bb. Two shoots from this branch bent back for the root of the intercostal Nerve.
- C. The division of the upper part of the trunk into four lesser branches, the uppermost of which c. being the Ophthalmick or belonging to the Eye, and entering the orb of the Eye, sends forth four shoots.
- c. The first being carried nigh to the ball of the Eye, is bent back into the Nostrils.
- d. The second passing by the outward orb of the Eye, is carried into the Muscles of the Forehead.
- ee. The third and fourth are distributed into the Eye-lids and interior Glandula's of the Eye.
- D. The second branch of the second division is also Ophthalmick, which entering the ball of the Eye, and carried towards the outward corner of the Eye, is distributed into the Eye-lids and outward Kernels.
- E. The third branch of the second division, or the maxillar, which passing by the orb of the Eye, enters an hole proper to the bone of the Jaw, in which passage it sends forth a shoot e. through another hole into the chewing Muscle, then arising up, it is carried out at the hole.
- f. A shoot into the Muscles of the Nose.
- ggg. It sends forth many shoots into the upper Lip.
- F. The lower branch or the fourth of the second division, which descending right towards the hollowness of the Mouth, is divided into two branches.
- h. The first is distributed into the Gums.
- i. The second is bestowed with many shoots upon the Palate.
- G. The second branch of the first division of the fifth pair, which tending straight downwards towards the lower Jaw, sends forth in its passage many shoots.
- k. A shoot of it into the Parotid Glandula's, or those near the Jaws.
- l. A shoot to the inward Mandible.
- m. A shoot which compassing about the process of the lower Jaws, is carried to the outward part of the exterior Masticator.
- n. Another shoot tending opposite to the former, having compassed the same process, is distributed into the inward part of the same Masticator.
- H. The trunk of the same greater branch carried further, is cleft into many shoots, of which
- o. Tends into the root of the Tongue.
- pp. Is carried with many shoots into the substance of the whole Tongue.
- q. Into the parts under the Tongue.
- r. Passing through the bone of the Jaw, is divided into many shoots which are dispersed, partly into the lower Lip s. s. s. and partly into the Chin t. t. t.

The Second Figure shews all the Nerves, which being carried from the Nerves of the third, fourth, fifth, and sixth Pair, are bestowed upon the Muscles and other parts of the Eye.

- A. The Nerve of the third pair carried to the three straight Muscles, and into the outward oblique one.
- B. The Nerve of the fifth pair, or the pathetick Nerve, goes whole into the trochlear Muscle.
- C. The Nerve of the sixth pair into the drawing back Muscle, and the seventh proper to Beasts.
- D. The Nerve of the fifth pair whose Ophthalmick branch E. is divided into two branches,
- F. The upper branch, being presently torn into many shoots, tends directly towards the inner corner, where it is bestowed on the Glandula's and Eye-lids.
- G. The lower Ophthalmick branch, which being divided into shoots, respects after a like manner the Glandula's and Eye-lids towards the outward corner of the Eyes.
- a. The Nerve of the fourth pair for the trochlear Muscle.
- b. A branch of the Nerve of the third pair for the Muscle lifting up the Eye-lids.
- c. A branch of the same pair for the Muscle shutting the Eye-lids.
- d. A branch of the same Nerve for the Muscle pressing close the Eye-lid.
- f. A branch of the same for the outward oblique Muscle.
- g. Lesser Nerves out of the infolding of the third pair, tending through the Sclerotick Coat into the Uvea.
- e. The Nerve of the sixth pair for the drawing-back Muscle.
- *** Fibres or lesser branches from the fifth and sixth pair for the seventh Muscle, proper to Brutes.
- h. A Nerve coming from the upper Ophthalmick branch into the Nostrils.
- i. A Nerve from the same branch into the Eye-brows and Fore-head.
- H. The trunk of the fifth pair cut off, which tends to the lower Jaw.
- I. A branch of the same cut off, which is carried to the Palate.
- K. Its upper maxillar branch.

CHAP. XXIII.

The Description of the eighth Pair of Nerves.

THE Conjugation of the Nerves of the eighth pair, accounted by the Ancients for the sixth, is called the Wandring pair; to wit, for that its Nerve, not content with one member or region of the Body, is thought to respect divers parts, and those different, and situate at a great distance one from another, and to reach forth its branchings, not only in the neighbourhood about the Head and Neck, but through the whole cavity of the middle and lowest Belly, and to most of the Bowels in either. But indeed this nerve hath a province large enough, yet not so diffuse as is commonly thought: for many other nerves, inoculated into this, joyn themselves with it, and are accounted a part of it, although they have distinct beginnings, and going away again from the nerve of the eighth pair, have peculiar divarications, and different from it. Wherefore, that we may give to each its own, we shall endeavour to prosecute this nerve of the wandring pair from the beginning to the end; and also shew the confederations and coincidences or joynings together of others with it.

The eighth Conjugation therefore of the Nerves arises below the auditory or hearing nerves out of the sides of the oblong Marrow, its root consisting of numerous Fibres. In a man there are at least twelve, some of which are greater, others smaller; to which is added a noted Fibre, or rather Nerve, much greater than the rest, from the spinal Marrow, which being joyned with them, and wrapped about with the same Coat, taken from the *Dura Mater*, goes forth together out of the Skull, as if they all grew into one Trunk: but that accessory nerve, yea and many other Fibres, do still remain distinct under that covering and afterwards departing asunder, are carried into peculiar provinces.

Because this spinal Nerve having passed the Skull, leaving its Conjugation, is carried to the muscles of the Neck and Shoulders; besides, the noted Fibre, out of the beginning of the wandring pair, is presently carried into the hard process of seventh Conjugation; and two other Fibres, having presently left the company of the rest, go into the muscles of the Throat and Neck: but the rest of the Fibres, being collected together, go forward still as Companions, and instead of their other Companions which departed from them, they presently get new in their places; to wit, sometimes the whole trunk of the intercostal nerve it self, as is seen in most four-footed Beasts, sometimes only a branch of it comes to them, as is observed in Man and some other living Creatures.

In this place where the trunk or branch of the intercostal Nerve is inoculated into the trunk of the wandering pair, a noted infolding is constituted, to wit, the trunk of the nerve being there made greater, seems to be lifted up, and to grow out into a certain Tumor like to a callous or finewy-swelled body: here, for that it is somewhat long, it is called by *Fallopian* the Olive body; of which sort the same Author affirms, there comes to this nerve sometimes one, sometimes two; but in truth, one is constantly found in the trunk of the wandering pair, but the other in the neighbouring intercostal.

Of these sort of infoldings in general we shall take notice, that they are made in the Nerves, as joyns in a Cane, or knots in the stem of a Tree, viz. as often as a branch goes out of the trunk, or sliding into another place, is received into the same; and when oftentimes some shoots go away from the place, and others come to it, the infolding there becomes greater; and so the more branches and shoots do happen to come together any where, or to go out of a nerve, the greater the bulk and magnitude of the infolding is increased: but if at any time a branch seems to proceed from any nerve without constituting an infolding, in truth, being included only in the same Coat, it is not accounted so much a branch as a companion which by a passage long before, had gone together forwards, as a single nerve it self, and distinct enough nor was it at all inoculated before its departure. But the use of these same infoldings seems to be the same with the knots in the stem of a Tree, or such as the turnings aside or by-paths that lye near cross-ways; to wit, that when the animal Spirits, together with the nervous Juyce, institute divers journies, left mutually, meeting, they should be confounded, they may be able to turn aside a little, and depart one from another till they may recover their orders and just method.

In the Dissection of the Nerves, which are distributed to the *Precordia* and *Viscera*, the two Ganglioform infoldings, to wit, the aforesaid in the trunk of the wandering pair, and the other near growing in the intercostal nerve, are as it were two bounding stones, which being first diligently traced, the other threads of the Anatomical task, both on this and that side, are easily handled. But that these infoldings may be found, the trunk of the *Carotidick* Artery is laid open on both sides between the Muscles of the Neck; then by following its tract, the aforesaid Olive bodies come into view about the insertion of the lower Mandible; out of which, both the upper beginnings and the lower branchings of either nerve, may be designed or drawn. But because about this place the nerves begin to be figured otherwise in a Man than in Brutes; that the reason of the difference may be known, we will here prosecute apart and distinctly the *Neurologie* or Doctrine of the Nerves of either, and first we shall deliver the *Hypothesis* of the wandering pair, and its confederations with the intercostal and other nerves, as they are found in Man.

The Ganglioform infolding therefore being constituted upon the Trunk of the wandering pair, receives one Nerve sent into it elsewhere, and sends forth another from it self. To this is brought a shoot from the intercostal nerve different from most brute beasts, where the whole trunk of the intercostal nerve comes, and seems to be united to the wandering pair. But from the aforesaid infolding, a noted branch being sent forth, is carried towards the *Larynx*, which when it is divided into three shoots, the first of them is stretched out into the Sphincter of the Throat; the second being hid under the Scutiform or Shield-like Cartilage, distributes its shoots to the upper Muscles of the *Larynx*, and to the Muscles by which the chink of the *Larynx* is shut up; and the third also entering the Shield-like Cartilage, meets the top of the returning nerve, and is united to the same. Such an inoculating of this nerve, with the returning nerve, is constantly found in man and in all other perfect Animals; the reason of which is delivered anon.

Below the aforesaid infolding of the wandering pair, its stem, near the side of the ascending *Carotidick* Artery, goes forward straight downwards, and in its journey imparts some small shoots to the same, which sometimes compass about the trunk of its Vessel, sometimes are inserted into its Coats. In the lower part of the Neck this trunk of the wandering pair admits a branch of the intercostal nerve from its neighbouring infolding, and in the left side about that place sends forth another nerve from it self into the returning nerve, which cross branch, being stretched out only in the left side, is found in man and all brute beasts: but from thence the trunk of the wandering pair descends without any noted branchings till it comes over against the first or second Rib; where another infolding being made, many shoots and numerous fibres are sent forth towards the Heart and its Appendix. But this divarication of the Cardiac nerves is not after the same manner altogether in either.

For in the left side one or two noted shoots being sent forth, together with the other shoots arising from the intercostal Nerve, are inserted into the Cardiac infolding; but many fibres going out at the same place, are distributed to the Vessels hanging to the Heart, and to its little Ears and *Pericardium*. In the right side a noted shoot going into the greater Cardiac infolding, another into the less, and two other shoots from the middle infolding of the intercostal Trunk towards the Cardiac infolding, associate themselves and are united. Besides, numerous Fibres in like manner descend into the Vessels of the Heart and the *Pericardium*. Also the returning Nerve in this side arising higher, is turned back about the axillary Artery, when in the left side the same going away much lower than this infolding from the Trunk of the wandering pair, compasses about the descending Trunk of the Aorta, and from thence it is turned back upwards.

The returning Nerve, although it seems a branch sent forth from the Trunk of the wandring pair, being indeed a distinct and singular nerve, comes even from the beginning of wandring pair; yet for better conducts sake it is contained under the same Coat with the rest of the Trunk of the wandring pair. In either side about the knots of reflection or turning back, it sends forth shoots and fibres which are distributed into the Vessels of the Heart. The reflected Nerve in its ascent receives in the left side a branch from the middle infolding of the Intercoastal, and another from the wandring pair; but either running back, distributes many shoots to the rough Artery; then its extremity meeting with the shoot, which is sent out of the Ganglioform infolding of the wandring pair, is united to it.

A little below the coming away of the returning Nerve on the left side from the Trunk of the wandring pair, another noted branch is sent forth on both sides; which being carried towards the Heart, covering its Basis in the hinder Region, meets it on both sides, and disperses in all its proceess branches through the whole Superficies of the Heart. As shoots go from these branches into the hinder part of the Heart, so many branches and shoots go from the Cardiac infoldings which are divaricated into its fore-part.

But there are two infoldings from which the Nerves are distributed into the Heart. The upper and greater is between the Aorta and the Pneumonick Artery. The nerves constituting this are one or two noted branches that descend hither from either side the Trunk of the wandring pair; but chiefly many nerves form either intercoastal nerve, to wit, from the midst of its infolding. From this infolding two or three noted nerves are carried under the Aorta into the left side of the Heart. But from this infolding a shoot being sent forth, making as it were an handle, compasses about the pneumonick Artery; and a branch descending from the right Trunk of the wandring pair to the exterior part of this handle, and another, which being carried from the nerve which is destinated to the hinder region of the Heart, meet together and make the lesser infolding; from which nerves are sent into the right side of the fore-part of the Heart.

We are to take notice, That in brute Animals many more and far greater Nerves are carried from the Trunk of the wandring pair into the Heart and its Appendix than in Man, to wit, in whom the chief Cardiac nerves or belonging to the Heart proceed from the intercoastal pair, as is shewed below; wherefore in Brutes, for that reason, the wandring pair affords greater supplies or subsidies to the Heart, because the intercoastal nerve scarcely contributes any to it. Further, through the whole tract of the wandring pair, from whence the Cardiac nerves proceed, very many small shoots, being sent forth on both sides, are inserted into the Oesophagus and the Glandula's implanted without the Pericardium.

From the Region of the Heart, the Trunk of the wandring pair sends forth many noted shoots on both sides, which being carried into the Lungs, are distributed together with the blood-carrying Vessels, through their whole substance, and in their passage step by step they follow the Pipes of the Bronchia, both the Arteries and the Veins, and many shoots being sent forth on every side, they climb upon and compass about these Vessels; then the Trunk of the same wandring pair, descending on both sides, nigh the sides of the Trachea, distributes many shoots also into the Coats of the Oesophagus.

Below the Pneumonick branches, either Trunk of the wandring pair going forwards downwards nigh the sides of the Oesophagus, is divided into two branches, viz. into the exterior or more outward, and the interior or more inward. Both the inward branches inclining towards one another mutually, do again grow into the same Nerve, which being sent straight down towards the Oesophagus, and being carried nigh the inward part of its Orifice, is bent back from thence, and creeps through its upper part. From both branches, being carried nigh the opposite parts of the superior Orifice, many shoots are produced, which being mutually inoculated, do constitute the nerves infolding like a little net. The Stomachical lower branch sends forth very many fibres and shoots nigh the left part of the bottom of the Ventricle, which are united with others, sent forth from the Mesenterick and Splenetick infolding. Further, in the right part of the same bottom of the Ventricle, shoots being sent forth from either Stomachical branch, are united with other shoots sent upwards from the Hepatick infolding; and about this place either Trunk of the Nerves of the eighth pair seems to be terminated, for that the last that may be perceived of it are some shoots sent forth from the Stomachical branches, which are inoculated or ingrafted with the little branches or fibres sent upwards from the Mesenterick infoldings.

C H A P. XXIV.

The Actions and Uses of the Nerve of the eighth Pair, described in the foregoing Chapter, are unfolded.

AFTER this manner the beginning and branchings out of the Nerves of the eighth pair are disposed in Man : and they are almost after the same manner in Brutes, unless the Cardiac branches be more, because in these they go out only from this one Conjugation. The Figure or Type of all these is well designed or drawn in the ninth Table or Figure. It now remains, recollecting the Tracts of this Description, or at least the things chiefly to be noted, that we inquire into the Reasons of their *Phænomena* or Appearances.

This Nerve, presently after its rise, appears with numerous Fibres, as may be discerned in the ninth Figure E : the reason of which is, because many nerves here arising together, and deriving plenty of animal Spirits from the same stock or provision, ought to carry the same to divers parts, and remote one from another ; and therefore they assume their *Latex* or Juyce, not at one Trunk, as the blood carrying Vessels, and afterwards distribute it equally by branches and shoots here and there stretched out ; because the Spirits, derived from the same Fountain, have need to flow into these parts separate from them, and variously to transpose and change their influence : wherefore for this business it is required (that we may not suppose little doors in the middle of the branchings out of the nerves, as are in the Pipes of a musical Organ) that the nerves, which are destinated for the performing of divers offices respectively in distinct parts, should be single in their whole passage, and of themselves distinct channels of Spirits ; for the sake of a better conduct many of them are collected together, and seem to grow together into one Trunk ; but they are parted both in their beginning, and also in their whole journey, and distinguished, though involved in the same Coat, and so are carried to the respective parts. Otherwise how should it come to pass, that the Spirits to be carried for the performing the instinct of motion towards the Stomach, do not enter at the same time the Lungs or *Præcordia*, and actuate them with an inordinate influence ? For indeed the shoots of the nerves of the wandering pair may be followed by the eyes and hand backwards towards the beginning, from the parts into which they are inserted, and where they seem to be united into the same Trunks so separated with the finger, that it may appear they are single. After the same manner we have plainly separated one from another the returning nerve also, and others, their common Coat being dissected. Yet in the mean time we deny not, that in their progress they do communicate one with another by Fibres meeting mutually, if it be granted, that the same, although they arise together, in their very rise it self are in a manner distinct. For by reason of the nearness of the beginning and progress, though all the nerves of the wandering pair have a certain Sympathy and consent in their actions ; yet for that they consist of parted strings, they perform their actions successively, and convey the influences of the Spirits to these parts separate from those.

We have already shewn, that the Nerve of the wandering pair, and others belonging to its family, do serve almost only to the involuntary Function. Wherefore it may be thought, that as there are many shoots and fibres, which going out distinctly from the same origine, are carried to divers parts, that indeed those Bowels and Members, into which these nerves are inserted, do perform their particular actions, stirred up either by the instinct of Nature, or by the force of the Passions, the Animal in the mean time scarce knowing it : yea also, that when certain other nerves, arising afar off, are joyned to this Trunk of the wandering pair, and communicate with it near the very origine of it ; this seems to be therefore done, that those nerves, an affinity with the wandering pair being begun, may be drawn into Sympathy with it, and into an unity of action of the involuntary Function. This appears clearly by the accessory nerve from the Back-bone, and some others, as shall be manifested anon.

In the mean time, we shall observe concerning the Fibres of the wandering pair, first that a noted shoot, inclining towards the vocal process of the seventh pair, is united with the same, as in the ninth Figure e. Hence a reason may be taken, wherefore in every violent Passion, as of Anger, Fear, Joy, and the like, without the will or intention of the Animal, the Tongue sends forth a voice, as an index of the excited affection ; so that not only men, but some brute beasts, in their fleeing or rejoycing, wail, cry out, and make a noise.

Secondly, from the beginning of the wandering pair very many Fibres are distributed into the Muscles of the Neck, Figure the ninth FFF. in which there seems little need of the stirring up of spontaneous motions in that part ; for to this task the Vertebral nerves serve sufficiently. Notwithstanding the aforesaid Fibres of the wandering pair are the cause why the Neck is moved about in fear, or at any noise or suspicion of danger ; and also, why in some Animals, from indignation or pride, the Muscles into which these nerves are inserted, being inflated very much, their necks swell up, and the Crests of many are erected. Of how great use the accessory nerve, coming from the Spine to the wandering pair, is for the pathetick motions of the *Attus*, shall be shewed presently.

Thirdly,

Thirdly, The other Fibres of the wandering pair, being gathered together, seem to grow together into the same Trunk, which presently constitutes the Ganglio form infolding from a shoot coming from the intercostal nerve, as in Figure the ninth *G. H.* And indeed it is very likely, that of these Fibres, which are complicated together in the Trunk of the wandering pair, one is destined to the returning nerve, another to the *Præcordia*, a third to the Lungs, and lastly, another to the Ventricle; all which, although they have communication among themselves, and for the sake of a better conduct are gathered together in one, yet they are still distinct from their very original, and constitute divers passages of the animal Spirits.

But that a shoot is carried from the intercostal Nerve into the upper infolding of the wandering pair, as in the ninth Figure *b*; the reason is, that between these nerves a certain strict affinity and kindred might be, and that either of them might be affected with the others offices. For as the nerve of the wandering pair distributes shoots chiefly to the *Præcordia*, and the Stomach, and the intercostal Nerve to the rest of the *Viscera* of the lower Belly; we may observe, that between all these there are not only some commerces, but Sympathies, and a consent of Actions and Passions; wherefore there is a necessity, that the nerves designed to either parts, should communicate among themselves. Further, in Man the intercostal nerve imparts to the Heart and its Appendix more shoots and fibres than the nerve of the wandering pair: wherefore these nerves, do not only communicate by these superiour infoldings, but also again a little lower by a shoot sent out from the cervical infolding, or that of the Neck.

From the aforesaid infolding a noted branch of the wandering pair is sent forth into the Muscles of the *Larynx*, a certain branch of which, entering the Shield-like Cartilage, meets with the returning nerve, and is united to it *Fig. 9. b*. It will not be difficult to collect what the use of this nerve may be; for seeing the *Larynx* or the rough Artery serves both for the drawing in and putting out of the breath, and also for the modulating the voice; for either office that its Trunk, like the folds in a pair of Bellows, may become sometimes more short, sometimes more at length, these same ringy Cartilages ought to be pulled together, or contracted sometimes upward, and sometimes downward. That a flat voice or sound might be formed, they ought to be prest down as much as may be to the bottom; but if you would form a more shrill or sharp sound or voice, the superiour Rings are lifted up; to wit, that the sound might be broken but only in the very passage of the Jaws. For the performing of this double motion of the *Larynx* two nerves are constituted like the hands of a Piper, one of which stops the lower holes, the other the upper of the Pipe: to wit, the shoots and branches of the returning nerve being lifted up from below, move the ringy Cartilages downwards; and the nerve sent out from above from this infolding, presently draws the more superior upwards. Further, because a certain consent and joyned action is required in both nerves, therefore they are mutually inoculated or ingrafted: yea, whenas either of them returning, distributes frequent shoots into either side of the *Trachea*; it seems that those that are sent out into the right part, move its Rings downwards for Inspiration and a strong Voice; and the others, going out on both sides into the left part, carry the Rings upward for Expiration and for an acute or sharp Voice. Moreover, as the instinct for the motion of depression or pressing down is delivered from the knots of the recourse or reflections; so the impression, for the elation or lifting up of those parts, is received from this nerve of the Ganglioform infolding.

A noted branch from the middle infolding of the intercostal Nerve is carried into the Trunk of the wandering pair, *Fig. 9. i*. For what end that is so, we have shewn already; to wit, that the commerces of the Spirits dwelling in both nerves, might be strengthened: but it should be noted, that it is only so in the left side where the Trunk of the wandering pair shews it self single for a long space; but in the right side, where the returning nerve goes from it much higher, here the other nerve from the intercostal infolding is plainly wanting.

About the Region of the first or second Rib, another noted infolding appears in the Trunk of the wandering pair, from which many shoots and fibres are sent towards the Heart and its Appendix, *Fig. 9. k*. Further, in brute Animals, about this place, the intercostal nerve leaves the Trunk of the wandering pair. Without doubt, some animal Spirits go apart in this infolding, which are destined to the anterior region of the Heart, also to the *Pericardium* and some of its Vessels, whilst other Spirits pass through, which a little lower are derived into the hinder region of the Heart; and which being yet carried further, go to the Lungs, and lastly to the Ventricle.

We may observe, that from the aforesaid infolding of the wandering pair numerous shoots and fibres are sent forth, which are distributed into the little ears of the Heart and all the sanguiferous Vessels belonging to the Heart, *Fig. 9. l. m.* which fibres and nervous shoots creeping along like Ivy, thickly cover over the Coats of the Vessels, and enter them in very many places, and variously bind them about. Truly this copious distribution of the nerves doth effect the pulsifick force in the little ears of the Heart and in the Arteries, or at least seems to excite it; and so to erect and strengthen those parts by a continual influx of the animal Spirits through these nerves, that they may be able to sustain an undiscontinued reciprocation of *Systole* and *Diastole*. Moreover, that the thick fibres and shoots of the nerves are inserted both into the Veins and Arteries, and bind both those kind of Vessels, and variously compass them about, we may lawfully suppose, that these nerves, as it were Reins put upon these blood-carrying Vessels, do sometimes dilate, and sometimes bind them hard together for the determining the motion of the Blood according

according to the various force of the Passions, or to deduce it here and there after a manifold manner; for by this means it comes to pass, that in fear the excursion of the blood is hindred, and in other Affections its motion is respectively altered.

But that many shoots and branches are inserted into the *Pericardium*, it seems to be for this use; to wit, that that little Chest which is made like a Fort for the defending the Heart from injuries, as often as any troublesome matter assaults or besieges it, might be able to draw it self together, and to shake off the enemy. For it seems, that the inordinate tremblings and shakings of the Heart, which are manifestly different from its natural Pulse, proceed from the violent shaking of this Membrane.

As to the Cardiac branches sent from this infolding, we observe, that they, because destinated to a publick office, do therefore communicate and enter into the pairs of either side before they are inserted into the Heart; for which end the infolding is made before the Basis of the Heart, where the aforesaid shoots from the wandering pair and many others, going out from either intercostal nerve, meet together. From that infolding, placed between the *Aorta* and the pneumonick Artery, very many branches being sent forth above, cover over the Hemisphere of the Heart: but yet from these certain branches, carried under the *Aorta*, are brought into the left side of the said Hemisphere; and as other pairs tend towards the right side, one of the first of them, making a little handle, binds about the pneumonick Artery; then meeting with other Cardiac shoots, makes the lesser infolding, out of which branches are sent forth into the right and anterior side of the Heart. That from the greater Cardiac infolding, nerves departing one from another, do institute contrary journeys towards the Heart, it is indeed, that they might come to divers regions of the Heart without meeting one another, and might affect its Vessels respectively in their passage; to wit, the branches carried this way, insert their shoots into the *Aorta*, and from the others going that way, one compasses about the pneumonick Artery. The reason of both seems to be, that the blood might be either sooner or slower drawn from the bosoms of the Heart for its various need or necessity. For whilst the aforesaid nerves do both sustain its motion by their influx, and also moderate and temper it by their instinct, it so comes to pass from thence, that those Vessels also, being affected by the same nerves, do further compose themselves to the requisite Analogies and proportions of the Pulses.

Indeed there are many Nerves, and those conspicuous enough, which are inserted into the Heart, and cover its outward substance with shoots sent forth from all sides; yet it is not to be thought, that these nerves alone perform and sustain the undiscontinued motion of the Heart: because so small little ropes seem too unequal for the perpetual agitation of such a Machine. Yea it may be observed, that more shoots and fibres of nerves are distributed into the little ears of the Heart and the depending Vessels, than into its frame or substance. Further, it is obvious to any that will behold it, that there is a greater plenty of nerves destinated to the Lungs, Liver, Spleen, Ventricle, or Reins, than to the Heart it self; so that some Anatomists (a *Fallopins* says) were doubtful, whether there were any nerves that belonged to the Heart or not. But this being clear enough, that we may describe the motive power of this Clock or Machine stirred up by the help of some small nerves, as it were an explosive motion, we say that the substance of the Heart it self consists of a very fibrous flesh, and may rather be called a Muscle than *Parenchyma* or congealed substance: wherefore in this, as in other Muscles, the implanted and proper fibres cause the local motion and constant shaking; but by the inserted nerves is only conveyed the instinct of the motion or action; for the performing of which office, both fewer Nerves and fewer animal Spirits flowing in through their passages, do suffice. But indeed we suppose, that the animal Spirits implanted in the Heart, and abiding within its Fibres, did at first flow thither through the nerves, and that by this way their expences or loss are made up or supplied; yet that the animal Spirits, which seem to be dispensed to the Heart by so sparing an hand, may suffice for the actuating this perpetual motion, they receive continually subsidiary Forces from the arterious blood. For elsewhere we have shewed, that in the Heart, as in the whole musculous stock besides, a sulphureous Copula, from the suggested blood, is joyned to the spirituous saline Particles of the implanted Spirits; which matter, whilst the Spirits are agitated, being at length struck off, and as it were exploded (just like the rarified and in kindled Particles of Gun-powder) for the effecting the motive endeavour, do blow up or intumesc the Muscle or the Heart it self; and so from the indiscontinued action of the Heart much of this sulphureous Copula, which is easily supplied from the blood, and less of the Spirits, which are brought by the passage of the nerves, is bestowed.

And here it may be rightly inquired into, whether the Pulse of the Heart so necessarily depends on the influence of the animal Spirits through the Nerves, that it being hindred, the action of the Heart should wholly cease? For the decision of this, we once made a tryal of the following Experiment upon a living Dog. The skin about the Throat being cut long-ways, and the Trunk of both the wandering pair being separated apart, we made a very strict Ligature; which being done, the Dog was presently silent, and seemed stunned, and suffered about the Hypochondria convulsive motions, with a great trembling of the Heart. But this affection quickly ceasing, afterwards he lay without any strength or lively aspect, as if dying, slow and impotent to any motion, and vomiting up any food that was given him: nevertheless his life as yet continued, neither was it presently extinguished after those nerves were wholly cut asunder; but this Animal lived for many days, and so long, till through long fasting, his strength and spirits being worn out, he died. The carcass being opened, the blood within the Ventricles of the Heart, and the Vessels on every side reaching from thence, to wit, both the Veins and Arteries,

teries, being greatly coagulated; was gathered into clotters; to wit, for this cause, because the blood; though for the sustaining of life, it was in some measure circulated, yet for the most part it stagnated both in the Heart, and in the Vessels. The cause of which stagnation I can assign to no other thing, than that the *Præcordia*, the influence of the animal Spirits being hindered, wanted its usual motions.

If it should be further demanded, from whence the animal Spirits (the passage of both the wandering pair being shut up) should be supplied to the Heart continuing still its motion; I say, that this may be done by the returning Nerves, as from the knots of which many Cardiack shoots and fibres proceed; and besides, the end of either nerve meeting with the nerve sent from the upper infolding, is united. But we shewed already, that the animal Spirits may be carried either this way or that way within the passages of the nerves; wherefore when the necessity of life urges, the provision of the Spirits, though lesser, being sent from the afore said infolding, is received by the tail of the returning nerve, and from thence by a retrograde passage it was derived into the Cardiack branches, and at length into the Heart itself. Further, there lyes open also another passage, and that perhaps more obvious, through the passage of the intercostal nerve: by this way in a man, as well as by the passage of the wandering pair, the Spirits are conveyed from the Brain to the *Præcordia*; yea also in Brutes a branch is carried into the Trunk of the wandering pair from the intercostal infolding; so that by this by-path some little rills of the animal Spirits (if by chance their influence should be hindered through their wonted chanel) might be carried to the Heart. However that Experiment seems to conclude, that the motion of the Heart depends no less upon the inflowing of the blood, than upon that of the animal Spirit: the total privation of either takes away life; and Eclipse of the Spirits wholly takes away from the Heart its motive power; and by the defect of the blood (so far as the sulphureous Copula is denied to the Spirit implanted in the Heart) the vigour and elastick force of the Heart is supprest, so that the Pulse being by degrees weakened, life is by little and little extinguished. Without doubt, in the finding out the tenour of the Pulse, we ought always to mind what the alteration of the animal Spirits, and what the fault of the blood may bring to it.

There is yet another consideration concerning the Nerves reaching from the Trunk of the wandering pair to the Heart, to wit, that by their passage, not only the solemn influence and state of the Spirits, for the equally performing of the vital Function, is conveyed; but also the instinct of every irregular motion, stirred up in the *Præcordia* by the force of the Passions, is in some measure transferred this way. I say, as to these, we ought to discourse and to shew by what means, as often as the impression of any Affection exercises the Imagination, or rather the Appetite, presently the *Præcordia* are disturbed by the passage of the Nerves; and by reason of their various Affections the motion of the blood is diversely altered. But because in a man the irregular and extraordinary motions of the *Præcordia* depend on the intercostal Nerve as much as and perhaps more than on the wandering pair; therefore we think good to defer this Speculation till the Theory of that Nerve is proposed. In the mean time, we will proceed to the other branches of the wandering pair; and what next follows, we will inquire into the offices and uses of the returning Nerves.

The returning Nerve in the left side, going away from the wandering pair below the afore said infolding, and sent towards the *Aorta*, is reflected or turned back about its descending Trunk, from whence being carried upwards, it imparts shoots to the Muscles of the *Trachea* and the *Larynx* sent forth by a long tract from either side of the Nerve; then its top or height is united with a shoot meeting it out of the Ganglioform infolding, *Fig. 9. n. **** b* But the returning Nerve on the right side is reflected much higher about the axillary Artery, to wit, proceeding from the lower infolding of the wandering pair, and after the same manner is bestowed on the other side of the *Trachea*, *Fig. 9. L.* But either returning back about the knots of reflection, sends forth towards the Heart very many shoots and fibres, which are inserted into its little ears, the appending Vessels or its Infoldings.

What the chief use of this Nerve is, we have already shewn; to wit, being rolled about on both sides the Artery, as it were a Windlace, it causes the little rings of the *Trachea* or Weasand to be drawn hither and thither, like the folds of a pair of Bellows, both for breathing and making a sound. But indeed either Nerve, so far as it being reflected about the Artery, is carried upward into the part to be moved, doth move downwards the little rings of the *Trachea* or Wind-pipe by certain shoots of it; also so far as either is terminated in the Nerve, sent from the Ganglioform infolding, it carries upwards the folds of the *Trachea* by other shoots of it. Hence a reason may be given, why the returning Nerves being cut off, every Animal is presently dumb; to wit, because, unless the *Trachea* be moved, the breath being blown out, passing without any refraction through its cavity, as it were through a Pipe alike hollow in its whole passage, gives no sound.

Concerning these Nerves we ought to inquire, what is the reason of the difference, that the knots of reflection are not alike on both sides; also for what end the Cardiack branches proceed from both knots. As to the first, that the left returning Nerve, not as its pair, binds about the axillary Artery, some reason seems to be, because the left axillary Artery, arising below, is carried as the right, by a bending, and not a straight passage, into the Arm; wherefore the little cord of the Nerve, compassing about its Trunk, hath no fixed, but a very moveable knot of reflection, for that it might easily slide from its place. But it may rather be said, that it is for other uses; and those more necessary, that these Nerves compass

pafs about thofe Veffels after that manner. For when they, as it were Reins or Bridles caft on the blood-carrying Veffels, by pulling them hither and thither, variously determine the courfe of the blood, it feems to be required, that one returning Nerve fhould bind together or conftinge the axillary Artery, and the other the defcending Trunk of the *Aorta*: for as often as there is need for the blood to flow forwards towards the Head more plentifully, the returning Nerves perform it eafily, by pulling upwards the aforefaid Arteries: but the blood, after a fort, ought to be continually urged into the higher parts, left otherwife by its weight it fhould turn too much downwards; wherefore in all Expiration or breathing forth, when the *Trachea* drawing nearer together its folds, is contracted upwards, the blood about to defcend the *Aorta*, is fnatched upwards by one tract of the nervous little cord, and in like manner, the axillary Artery in the right fide being fhaken with it, the blood flowing in the whole afcending Trunk of the *Aorta*, is driven upwards a little fwifter.

But befides this continual and equal fnatching up of the blood towards the upper parts, it is fometimes occasionally urged towards the Head by a more intense and quick motion of the *Trachea*, and alfo by a more full and fwift courfe. For as often as any Animal grows angry, the voice prefently fhews figns of fuch an Affection, and oftentimes by chiding, they make it fharp; as men, when they are angry, chide or brawl, and Dogs bark: Now from fuch an intenfion of the voice and chiding, as the upper rings of the *Trachea*, a reciprocation being there made, are often struck together; fo the blood alfo (the *Aorta* being ftrongly drawn) is urged upwards by a copious afflux, fo that it prefently dyes the countenance and eyes of angry people with a rednefs, and induces to the Brain it felf a greater heat and provocatives to anger, and a greater glowing or infiring to the Spirits by ftrring them up. For the fame reafon, in Joy and Gladnefs, forasmuch as the *Trachea* is exercifed by finging or laughing, the blood alfo is poured out more plentifully towards the exterior, and efpecially the upper parts.

And from hence the caufe is plain, wherefore either returning Nerve fends forth Cardiack branches from the knot of reflection or turning back; to wit, that in thofe kind of affections, the notice of which the *Trachea* in founds or voices gives by the help of the Nerves, the Heart it felf by its means alfo might be affected, For fo, as often as we wrangle or brawl, the Heart being irritated, prefently inkindles the blood more, and drives it forward more plentifully, as food for thofe Affections, towards the Brain. Alfo in laughter, great rejoycing, or finging, by the paffage of thofe Nerves, the Heart being brought into a confent or Sympathy, or joynt action, prefently explodes or drives out the blood by a fwifter pulse, and cafts it haftily out, which otherwife would be heavy and troublefom by a flower motion or ftagnation; wherefore thofe forts of actions, to wit, laughing and finging, are faid to alleviate the Heart, becaufe they make the blood more freely and readily to be poured out of the bofoms of the Heart, and alfo by the fupplying help of the Lungs, to be emptied into the fame.

Below the production of the left returning Nerve another noted Nerve is carried towards the hindermoft region of the Heart, which being carried with a certain compafs about its Basis, fends forth frequent fhoots, which cover the left fide of the hinder Hemisphere, *Fig. 9. o.* Then this branch meeting with another pair fent from the oppofite fide towards the Heart, and diftributing fhoots into the right fide of the hinder Hemisphere, is united with it, *Fig. 9. q.*

This Cardiack branch, deftinated to the hinder region of the Heart, is produced apart below the reft, that it might be carried by it felf to its Providence without the meeting with or implication of others; the pairs are ingrafted on either fide, that they might accompany one another, and be together drawn in the fame action of the Heart. It appears not plain, whether thefe nerves confpire with the other Cardiack nerves, arifing above, reaching forth to the anterior Hemisphere of the Heart; or whether this pair effect not the *Systole* of the Heart, and the upper its *Diaftole*. However it is, certain fhoots of the kindred or flock of either, being ingrafted with others of another flock, communicate one with the other.

The Trunk of the wandering pair fends forth on both fides very many noted branches from the region of the Heart, which are fpread on either fide into all the Lobes of the Lungs, the *Bronchia* of the *Trachia*, and the Coat of the *Oefophagus* hard by defcending, *Fig. 9. s.s.s.* Thofe which go into the Lungs pafs every where through their whole fubftance, following the ramifications of the Veins and Arteries, and the Pipes of the *Bronchia*, which chanel of blood and air they variously climb over, and bind about through their whole tract.

When that fo many noted branchings of the Nerves are beftowed on the Lungs, it is a wonder, that by fome they fhould be thought to be infenfible and immoveable of themfelves. Yea it is doubted by many, whether thefe Bowels do caufe the motions of the *Systole* and *Diaftole* of themfelves by their own endeavour. For that it is a received Opinion, That this reciprocation of the Lungs doth proceed wholly from the motion of the *Thorax*, and doth obey or obferve its dilatation or contraction with a certain neceffary dependency; viz. that the Breaf being dilated or fpread open after the manner of a pair of Bellows doth compel the ambient Air into the *Trachea*, which rufhing into the Lungs, blows up and diftends them; then the fame Breaf fubfiding or finking of it felf, that the Lungs being preffed together with the weight of it, do breath forth the Air before intruded. In truth, however that I might judge, that the *Diaphragma* and the Mufcles of the Breaf do conduce much to Refpiration; yet that thefe parts fhould perform this office alone, and that the Lungs are merely paffive, I cannot grant. For Refpiration is chiefly intituted for the fake of the blood and the Heart, and its act is wont to be determined according to the various difpofition of thefe, and to be altered every

every minute of an hour almost according to the manifold necessity of the Pulse. But indeed the Lungs themselves are they (and not the *Diaphragma* or the Muscles of the *Thorax*) which the blood, boiling out of the Heart, passes through, and continually affects according to its temper, and the tenour of the Pulse: wherefore from hence it may be concluded, That the Lungs themselves do conceive the first instincts of their motions, and by the help of the aforesaid Nerves, do in some measure exercise themselves, and endeavour the *Systole* and *Diastole*, and design them according to the sense of its proper necessity; but when in these, Fibres requisite for local motion are wanting, therefore the *Diaphragma* and the Muscles of the *Thorax* help continually the endeavours of the Lungs; and by the coöperation of these, compleat breathing is effected. And so when Nerves of a twofold kind, to wit, some from the Spine being inserted into the Muscles of the *Diaphragma* and the *Thorax*, and others from the wandering pair distributed into the Lungs, actuate the Organs of Respiration; for that reason it comes to pass, that the act it self of Respiration, of it self unforced and involuntary, may be at our pleasure somewhat restrained, interrupted, and diversly altered. The *Sympaxis* or joint action of the Nerves of either kind, in the work of Respiration shall be shewed hereafter, when we shall speak particularly of the Nerve of the *Diaphragma*.

It yet appears more plain, that the Lungs are oftentimes the chief in the act of Respiration, because they being irritated from strange and improporionate objects, presently conceive irregular and violent motions; as when a vehement Cough is stirred up for the exclusion of any troublesome thing; to which motion the *Diaphragma* and the Muscles of the *Thorax* presently obey. In like manner, in difficult and sighing breathing, or any other ways unequal, its first instinct for the most part is begun by the Lungs; yet sometimes when the exterior Organs of Respiration are excited into irregular motions, the Lungs also are compelled to follow their irregularities; so when the *Diaphragma* after a manner begins laughter, the Lungs perform the same with a following cackling sound: so all the Organs of Respiration intimately conspire and agree among themselves, that although one of them do a thing inordinately, rather than there shall be a Schism, the rest do imitate or follow its irregularity.

But that the Nerves, following the Arteries and Veins through the whole frame of the Lungs, do variously bind about and cloath their Trunks with a thick series of shoots, the reason seems to be, both that the Coats of the Vessels being gifted with a constant influx of animal Spirits, might imitate the motion of the Heart; and by that means, by a continual pulsation of the Arteries and the constriction of the Veins, they might easily carry the blood in this its more short lustration through the Lungs; and the rather, that the pneumonick Vessels, being bound about with such Reins of Nerves, might moderate the course of the blood according to the forces and instincts of the Passions. For whereas the exterior circulation of the blood depends upon this interior; as the blood is commanded to pass sooner or slower through the Lungs, or to stay there and be hindered, the excursion and return of it also from or towards the Heart is wholly performed. In Joy or Anger, because the Lungs rapidly transfer the blood out of one bosom of the Heart to the other; therefore its swifter and more plentiful flowing out into the outward parts, follows. In like manner, in Fear and Sadness, for that the Lungs (its Vessels being strained together) deliver the blood to the Heart by the Veins, and do not then presently carry it back by the Arteries, the outmost region of the Body is destitute of its due influx. Notwithstanding these kind of pathetick snatches of the blood are in some measure performed, because its Vessels are bound about in other places in like manner with the Nerves. If at any time Spasmodick Affections should afflict the pneumonick Nerves from a morbid cause, so that being twitcht with inordinate motions, they should pull or draw together here and there the Arteries and Veins which they embrace; for that cause, the blood either too much flowing out of the Lungs, makes them to flag, and to fall together into themselves, so that drawing to them copiously the Air, they do not easily render it back again; or, which frequently happens, the blood being detained within the Lungs, and there stagnating, stuffs them up, and holds them a long while stiff, that they cannot inspire or draw in the Air. The Symptoms of either kind ordinarily happen in the Hysterick distempers, and in some Hypochondriacal. Yea sometimes the *Bronchia* themselves are pulled together by the like Convulsion of the Nerves, and are hindered in their motion, so that they cannot take in and send forth the Air after its due manner, as may be seen in Asthmatical Fits. The distempers of which sort are oftentimes produced by the fault of the Nerves, without any implanted Dyscrasie or evil disposition of the Lungs. I have sometimes observed some Cases of sick people, in which, when at one time the morbidick matter besieging the Brain, had induced Lethargick or Vertiginous Symptoms, a little after the same matter occupying or possessing the origines or middle processes of the nerves belonging to the Lungs, has suddenly excited a most horrid Asthma without any previous Cough or Catarrh.

But that out of the same tract of the wandering pair many shoots are distributed into the Lungs and also many others into the Coats of the *Oesophagus*; from hence a reason may be given, why a troublesome Cough oftentimes causes Vomiting and a subversion of the Ventricle; why also on the other side a perturbation of the Ventricle so frequently induces a troublesome endeavour of Coughing. I have known in Hypochondriacks, that aliments of ill digestion, taken into the Stomach, have presently excited a vain and very pertinacious Cough; in the mean time, that the Lungs were free from any consumptive disposition. The cause of either distemper seems to be, that when the nerves, disseminated in either part, are taken with a Convulsion, oftentimes those which are of the other part, are drawn into a consent of the same distem-

per. Perhaps from hence it happens, that sometimes an Asthma is induced by reason of the evil of the Ventricle, and that that distemper (as *Riverius* observes) is often wont to be cured by an emetick Medicine.

After so many branches and shoots have been sent from both sides the wandering pair, at length its Trunk is divided below the Lungs into two branches, viz. the exterior and interior; either of which inclining towards the pair of branches on the other side, are united to them, and after a mutual communication they constitute the two Stomachical branches, viz. the superior and the inferior, *Fig. 9. a. n. n.*

It is worth observing, with what wonderful artifice either Trunk of the wandering pair do communicate one with the other with two branches, as it were two hands meeting one the other, that the influence of either nerve might equally reach to every region and part of the Stomach. For when as either Stomachical branch, to wit, both the upper and the lower, is carried together from the two branches coming out from either side of the wandering pair; it is provided, that the Tributes of the Spirits destined to the Ventricle, should be at once certain and very plentiful. For what appertains to the performing the action of this Bowel or Chylification, the Spirits flowing in from either side, are abundantly distributed into the Orifice, and from thence into all its parts and private places; and by that means it comes to pass, that the Stomach dissolves bodies beyond the force of any Chymical Menstruum. Then besides, as to the feeling or sense of the Ventricle, or the affection of it from things ingested; it is carried also towards the Head by a double way (whereby the passage may be the more certain) to wit, by either Trunk of the wandering pair; that for that reason being endued with a most exquisite sense, it might not be deceived concerning its objects; and if that any thing inimical or contrary to it, should lye hid among what is eaten, it might discern it and thrust it out of its own accord, or at least by the knowledge only of the Cerebel.

That from the same double Trunk of the wandering pair, from whence the Cardiac Nerves arise a little above, the Stomachical branches also proceed, the cause is plain, wherefore the Heart it hath such a Sympathy with the Stomach, so that its *Deliquium* or Swooning follows upon any great pulling or hawling of this.

Either Nerve of the wandering pair is terminated in the Ventricle it self: for after the eighth Conjugation hath made as it were an high road for the passage of the animal Spirits to the *Præcordia* and to this noble Bowel, it puts a bound to it self; nor indeed does it seem meet to have its branches stretched out any further to the *Viscera* of the lower Belly: because it seems an unworthy thing, that the same path which leads to the chief office of nutrition and to the Palaces of life it self, should lye open to the more vile Intestines also, and the sink of the whole Body. And truly, although the ample path and broad way of the wandering pair is not produced beyond the Ventricle; yet because a frequent commerce happens between this and the *Præcordia* and the other inferior parts; therefore between the Stomach and the other Bowels; though of a more base use, certain Fibres, as it were smaller paths, are reached forth, in which, at least little bands of Spirits, like Discoverers or Messengers, run to and fro.

CHAP. XXV.

A Description of the Intercostal Nerve.

After the unfolding of the Nerve reaching forth to the *Præcordia* and the Ventricle, we are led by the series or order of the inward parts to the describing a Nerve a kin to this, and which reaches forth its branches to the furthestmost Province, to wit, to all the *Viscera* or Inwards of the lower Belly contained below the Ventricle. This is commonly called the Intercostal; because that going near the roots of the Ribs, it receives in every one of their Interstices a branch from the spinal Marrow. Its beginning is not yet sufficiently detected: for by most Anatomists it is wrongfully taken for a branch of the wandering pair, though indeed the wandering and the intercostal pair do communicate among themselves by branches sent forth one to the other; yet as to both their beginnings, Trunks and wanderings up and down, they are plainly distinguished. If that this latter Conjugation, being denied the title of a peculiar nerve, ought to confess it self of another stock, certainly it owes nothing to the wandering pair, but should borrow its original from the Nerves of the fifth and sixth pairs; for two or three shoots being sent back from those nerves going out towards the Eyes and Face, go into the same stock or Trunk, which is the Trunk of the intercostal nerve, as we have intimated before.

The intercostal Nerve being constituted after that manner, and going out of the Skull at a proper hole, presently contains the Ganglioform infolding, Near to another the like infolding of the wandering pair; into which two nervous Processes are carried from the last pair within the Skull, or the first Vertebral. From that infolding one shoot is sent forth into the Sphincter of the Throat, and another noted one into the Ganglioform infolding of the wandering pair. Then this nerve descending towards the

Ventricle,

Vertebra, hath in the middle of the Neck another far greater infolding, into which an ample nerve, from the neighbouring Vertebral pair, is inserted; but from the same many nerves, which respect the *Precordia*, are distributed on every side: For two or three shoots are sent forth into the nerve of the *Diaphragma*, and one shoot into the returning nerve; besides numerous fibres and shoots are carried both into the returning nerve, and towards the *Trachea*, which are inserted into its Coats, and into those of the *Oesophagus*, and into the blood-carrying Vessels. Further, one branch descends into the Trunk of the wandering pair, and two noted nerves into the *Cardiack* infolding; then a little lower another nerve by it self, proceeding out of the intercostal Trunk, is inserted also into the *Cardiack* infolding: which noted branches sent down on both sides from the intercostal nerve, for that they joyn together with others derived from either Trunk of the wandering pair, make the *Cardiack* infolding it self. But these *Cardiack* branches from the intercostal nerve, as also the *Cervical* infolding, or that in the hinder part of the Neck, whence they proceed, are peculiar to men, and are wholly wanting in brute beasts.

The intercostal Trunk descends from the cervical infolding towards the chanel-bone, where being about to enter the cavity of the Breast, it falls upon the axillary Artery, as it were in right Angles, and strains or binds it; from whence it is drowned or hidden in the *Thorax* near the roots of the first and second Ribs; and there receiving three or four branches from the Vertebral nerves next to those uppermost, constitutes another infolding, which is commonly called the Intercostal infolding. The uppermost of these Vertebral nerves coming to this infolding in its journey binds the Vertebral Artery, and almost compasses it about. In Brutes by this nerve which comes upon the Vertebral Artery, the intercostal infolding communicates with the root of the nerve of the *Diaphragma*, and not by any other means, unless by small fibres sent forth from the lower part of the infolding into the Vertebral nerves. Further, in Brutes a noted branch is carried from this infolding into the Trunk of the wandering pair. But in Man the intercostal Trunk passes through the cavity of the *Thorax* without any communication had with the other parts; unless that from hence in its whole descent, running near the roots of the Ribs, it admits in every one of their interspaces and from thence even to the *Os sacrum* from between the knots of the *Vertebra*, a Vertebral branch.

The intercostal pair sends forth a noted branch on either side, where having gone through the cavity of the *Thorax* or Breast, it comes over against the bottom of the Ventricle, which tending towards the *Mesentery*, constitutes the chief infoldings of it. But there are seven *Mesenterick* infoldings, viz. five great superior, and two less inferior: out of all which, numerous shoots and fibres are sent forth together into the parts which they respect, and into the neighbouring infoldings. The *Mesenterick* nerves, which are carried into these infoldings, and the infoldings themselves, and also the fibres and shoots, which flow out from them on every side, like rays of light, are disposed according to the following manner both in Man and in the more perfect Brutes.

The *Mesenterick* branch therefore in the left side going from the intercostal Nerve, and bending downwards, is parted into two noted shoots: the greater of these bending back upwards towards the Stomach, diffuseth it self presently into an infolding, as a narrow rivulet into a spacious Pool. From this infolding numerous fibres and shoots go forth as it were in four bands. The first of these, and which is the greatest bundle of its fibres, being carried into the Ventricle, is bestowed partly in the bottom of it, and partly these fibres are met, and ingrafted with others sent from the Stomachical branch. The other maniple or band of nervous Fibres goes forth from this infolding to the Spleen, where the nerves accompanying the sanguiferous Vessels, and variously binding them about, are dispersed into the more inward frame or substance of the Spleen; yet out of which going towards the Spleen, some shoots following the short Vessels are carried into the Stomach. The third Company of nervous Fibres is inserted between this infolding, and the Hepatick or that belonging to the Liver, placed in the right side over against it. Lastly, the fourth Conjugation of Fibres knits together this and the greatest infolding of the *Mesentery* lying under it.

The lower shoot of the *Mesenterick* branch, which is on the left side, increases into an infolding, to which the next Vertebral branch, destinated to the intercostal Nerve, is carried. From this infolding the chief bundle of the nervous Fibres is carried into the left Kidney, and before the Fibres enter the Reins, they bind and variously compass about the emulgent Vessels. Further, between this infolding and the greatest of the *Mesentery* many Fibres are stretched out; from hence also many shoots are distributed into the atrabiliary Chest, or the Receptacle of the Spleens excrements.

In the right side the *Mesenterick* branch being sent from the intercostal Trunk, and being in like manner twofold, contains in its upper shoot the Hepatick infolding; out of which the greatest bundle of nervous Fibres is carried towards the Liver; numerous shoots of which accompanying the blood-carrying Vessels, greatly beset, and as it were cloath with a little net the Trunk of the Hepatick Artery: which Fibres and shoots, being carried higher, are distributed into the Liver, Gall chest or bag, the passage of the Gall, the Pylorus, and the Pancreas. Further, many Fibres, which are of this Conjugation, meet with Fibres sent from either Stomachical nerve, and are ingrafted into them. Another hand of nervous Fibres is stretched out between this infolding and the opposite infolding to the Spleen, and another between this and the greatest infolding of the *Mesentery*; yea, there is some communication had between this and that belonging to the Kidney lying under the same side by a large shoot sent down.

The lower shoot of the right Mesenterick branch, like as it is in the opposite side, contains a sufficiently noted infolding nigh the atrabiliary Chest; to which presently the intercostal Nerve imparts its Vertebral branch received below. From this infolding the chief bundle of nervous Fibres destinated to the Reins, embraces the blood-carrying Vessels in like manner as in the opposite side; also many fibres and shoots are stretched out from this infolding to those near, viz. the Hepatick and the greatest of the Mesentery; yea, certain Fibres are dispersed from the same into the atrabiliary Chest.

After this manner either Mesenterick branch being carried from the intercostal pair, and being presently twofold, immediately constitutes two infoldings in either side. In the midst of these the infolding of all stands like the Sun in the midst of the Planets; from which numerous shoots and fibres are dispersed into all the parts of the Mesentery; which indeed following the blood-carrying Vessels in their whole process, climb over and bind about the same. Moreover, between this infolding and every one of the four aforesaid is produced a peculiar little bundle of Fibres. Besides, in the female Sex, from hence some shoots are carried into the Glandula's of the Womb, commonly called the Stones. But from the Mesenterick branches, which constitute the former infoldings, no noted branches, but only little shoots, are sent into this infolding. Yea the chief Nerve which is inserted to this, and seems to be the primary for the conveying of plenty of Spirits into it, and a broad way, is carried from a certain small infolding far lower nigh the straight Intestine; which infolding, together with the other neighbouring one, that we call the lesser infoldings of the Mesentery, shall be described presently. In the mean time, that we may proceed to them in order, we will follow the passage of the intercostal Nerve.

Below the Mesenterick branches, from which the aforesaid superior infoldings are constituted, the intercostal Trunk descends between the Muscles of the Loyns, and bestows every Vertebral branch, admitted in its descent, upon some internal parts.

For the Vertebral branch brought to the intercostal Trunk nigh both Kidneys, is carried into the Womens Testicles, then some following into the Ureters. From the Region of the twenty seventh Vertebra one Vertebral branch and two others, going from the intercostal Trunk, tends towards the strait Intestine, and there they meet with three pair sent from the other side; all which being united, constitute the infolding, which is the lowest of the Abdomen. From this infolding a noted Nerve, being carried upwards, is brought into the greatest infolding of the Mesentery, which in its journey receives one and then another shoot sent down on both sides from the intercostal Nerve; and there, near its bounds, distributes some shoots into the Glandula's of the Womb.

But from the lowest aforesaid infolding, a Nerve going towards the upper Infoldings, about the space of an inch, constitutes another lesser infolding in the neighbourhood; out of which one Nerve tends upwards, and another opposite straight downwards. The former of them is carried into the greatest infolding of the Mesentery, and in its whole passage stretches under the straight Intestine, and part of the Colon, and inserts into them many small shoots. But the other Nerve descending from this infolding towards the Anus under the inferior part of the straight Intestine, imparts to it also frequent shoots; so that this infolding, the least of all those which are within the Abdomen, seems to be constituted for the sake of this Nerve only, to wit, which lying under the straight Intestine and part of the Colon, is inserted into the greatest infolding of the Mesentery.

From the lowest neighbouring Infolding, to which this least owes its original, two Nerves going out, and being sent down into the Pelvis, cause there two infoldings, viz. one in either side, in which the Nerves coming from the Os sacrum, and ingrafted with the former, meet; from which also the Nerves distributed into the adjacent parts, serve unto the several Excretions, viz. of the Urine, Dung, and Seed made in that place: for two Nerves enter into the end of the straight Intestine, and as many into the Womb or Prostates; but one and that noted one, is carried into the Bladder.

But that we may return to the Intercostal pair, after either Trunk of it had sent forth three branches, out of which the aforesaid lower infoldings of the Abdomen are mediately or immediately made, it descends straight towards the Os sacrum, and in its journey sends forth yet one or two branches into the Ureters: but as soon as it is come to the beginning of the Os sacrum, both nerves mutually inclining themselves to one another, are demerged within the bending of the same bone, and there nigh its declining, and then in its descent, they seem to be knit together upon it by two or three processes; and so at length either nerve ends in very small fibres, which are distributed into the Sphincter of the Anus. But sometimes either nerve joyn together into a round infolding nigh one transverse process, out of which single infolding the like very small Fibres are produced. Further, many others from the last Vertebral Nerve meet with, and are ingrafted with these Fibres from the intercostal pair inserted into the Anus.

C H A P. XXVI.

The Explication of the Intercostal Pair of Nerves which are described in the former Chapter as to their Offices and Uses : and first the upper Branching of them is considered.

THE beginning of the Intercostal Nerve are two or three shoots reflected or turned back from the Nerves of the fifth and sixth pair, and united into the same Trunk, *Fig. 9. D. a. a. b.* Here we may wonder at the birth of this Nerve, as it were borrowed; for it grows as a shrub upon another tree or shrub; and therefore dispenses the common virtues and influences of either with a double branching, *viz.* both its own and that of its parent: by which ramification or branching it comes to pass, that there are very quick commerces and consent between the conceptions of the Brain and the affections of the *Præcordia*, also between the Actions and Passions almost of all the parts of the whole Body, which belong to the involuntary Function. For in that the Trunk of the intercostal Nerve proceeds from the Nerves of the fifth and sixth pair nigh their beginnings, that is a sign that both the influence of the animal Spirits, and the instincts for the performing of motions, are derived chiefly into it from the Cerebel; to wit, from whose annular process the aforesaid pairs of Nerves arise. But forasmuch as the same intercostal Nerve is rooted in their Trunks, and not immediately in the Cerebel; this is the reason why the Eyes, as also the parts of the Mouth and Face, to which the fifth and sixth pairs have regard, do answer so readily and unknown to the Cerebel, as it were by the same act, to the motions of the *Præcordia* and *Viscera*, which the intercostal Nerve effects; and on the contrary, the motions of these presently follow the action of those. As for example, in Sneezing as soon as the nervous Fibres besmearing the Nostrils, are wrinkled together by the pulling, presently by the passage of the intercostal nerve the Diaphragma, by reason of a more deep inspiration or drawing in the breath, is for some time depressed; then the Cramp of the Nostrils remitting, the Midriff also being violently drawn back, causes a more strong breathing forth with a vehement blowing of the Air. In like manner on the contrary, when by a tickling made upon the Ribs, the Diaphragma being affected with a Spasm, moves to a cackling noise, the Face and Mouth are pathetically figured with it into laughter.

The intercostal Nerve being slid out of the Skull, presently constitutes the Ganglioform infolding *Fig. 9. G.* it being after the same manner in the Trunk of the wandering pair. What the use of these infoldings is in general, we have already shewn; and clearly for the same reason in this place in the intercostal Trunk, where it receives into it self some nerves from elsewhere, and sends forth others from it self into the neighbouring parts, this infolding, as it were a knot in the stem of a flourishing Tree, is made, that it may be as it were a diverting place for the manifold tendency of the Spirits. As to the adventitious Nerves it is observed, That by them plenty of subsidiary Spirits are transmitted hither, only from the spinal Marrow, but by a manifold and frequent passage; wherefore in this infolding, and again in the following, then a little lower, nigh the several junctures of the *Vertebrae*, the Vertebral branch comes to either Trunk of the intercostal pair: this seems to be so constituted for many uses. First, That the intercostal Nerve, by the reiterated fastening to the solid parts, as it were by a frequent stay, might become the more firm for the making of a long journey, when otherwise its little rope, by too much stretching out, might be easily broken. Secondly, By this means it comes to pass, that the nerves which are the Executors of the spontaneous, and those of the involuntary Function, might have both a more certain commerce together, and might be sometimes excited into mutual succors. Hence Respiration and some other Acts, especially what concerns the Act of *Venus*, participate of either Regiment, so that sometimes they follow the will, and sometimes draw it even by force or unwilling. Further, when at any time the stock of animal Spirits is deficient in either Province, supplies of them are sought from the other: to wit, (as we hinted above) if the influence towards the *Præcordia* be shut up through the ordinary passages, *viz.* the internal nerves, their passages requisite for the sustaining of life, might be supplied by the Vertebral branches: yea it is probable in the partial *Apoplexie*, and in the *Incubus* or Night-mare, when the Cerebel being affected, the Spirits destinated for the Heart, suffer an Eclipse in the Fountain it self, that through these Emissaries, to wit, the Vertebral branches inserted into the intercostal pair, some extemporary Sublides are carried for the actuating the Heart. Thirdly, The Vertebral branches by so frequent an insertion, are added to the intercostal nerve, perchance in some respect for this end also, that the superfluous or excrementitious humidities, heaped together about the spinal Marrow, might be sent away by these Processes: for indeed we have already shewn, that a certain humor doth abound within the Head, the medullar Appendix, and nervous System; which oftentimes (when it becomes watry, or abounds above measure) begets a serous heap in those parts: wherefore when the branches of the intercostal nerve are terminated into the Mesentery, Kidneys, Intestines, and some Genital parts, it is probable they do transfer into these sinks superfluous humidities, not only their own, but also of another sort, to wit, those received from the spinal Nerves.

As to the Nerves, which as Emissaries, are carried from the aforesaid Ganglioform infolding into other parts, we observe; first, that a noted shoot is carried from hence into the Sphincter of the Throat, *Fig. 9. γ.* This nerve in the Sphincter of the Throat corresponds with others akin, arising higher from the fifth pair, and distributed into the parts of the Palate and Mouth, and is helpful to them in the business of chewing: for when the maxillar branches of the fifth pair should perform their work for the chewing of the food taken in, the task of this nerve mediately arising also from the fifth pair, follows to wit, whereby the Throat being opened, the chewed meats may be thrust forward into its passage.

Another shoot is stretched out from this infolding into a like infolding of the wandering pair placed near, *Fig. 9. α.* The reason of this insertion is delivered above, where we treat of the wandering Pair. But it may be observed further concerning this; when so nigh a communication happens between these infoldings, and when shoots are sent from one of them into the Muscles of the *Larynx*, and from another into the Muscles of the Throat, from hence we may give a reason, why in Hysterick distempers and in some Hypochondriacal, here is so frequent and familiar a Symptom of the sense of choaking in the Throat. For a Cramp or Convulsion being begun in any Nerve, it is wont to creep forward further by the passage of the same, and so to invade sometimes these parts, sometimes those successively. If therefore at any time a Spasm arises any where in any nerve of the wandering or intercostal pair, and from thence tending upwards or downwards, shall come to either infolding, presently both being affected, and the Muscles of the whole neighbourhood being contracted, a bulk or Tumor like a Globe or round thing in the Throat is excited with a sense of choaking.

The intercostal Nerve descending a little lower, contains in the neck another greater infolding proper to man, to which a noted Vertebral nerve is inserted also, out of which many nerves destinated to the *Præcordia*, are sent forth on either side, *Fig. 9. T.* As to the principle parts, to wit, the Brain and Heart, there is no such great difference between a Man and a Brute, as there is about the passage of one to the other, or the commerce that those parts have mutually among themselves. In either kind, for the exercise of the vital Function, the animal Spirits are derived from the Head, with a constant emanation into the Heart; to which sort of influence of theirs the passage of the wandering pair of nerves seems sufficient: wherefore in most Brutes the passage to the Heart and its Appendix lyes open only by this way, and scarce at all by any nerves of the intercostal pair. But in Man the intercostal nerve, besides its offices in the lower Belly, common to him with other Animals, serves in the place of a special Internuncius also before the Cloister of the Breast, which bears the mutual senses of the Brain and Heart this way and that way, or to and fro. For when, besides the nerves of the wandering pair, stretched out also into the humane *Præcordia*, (which certainly seems sufficient for the executing of the offices of the Function merely vital) so many noted branches are sent forth from the aforesaid intercostal infolding, what kind of office should be attributed to these, unless that they should contain the animal Spirits, by whose work and ministry, the mutual respects and affections of the Brain and Heart should be communicated to one another? Whilst I consider this difference of either kind, it comes into my mind, that Brutes are like Machines framed with a more simple furniture and with less workmanship, and therefore furnished with a motion of one kind only, or determined for the doing still the same thing. But in Man divers series of motions, and as it were complications of wheels within wheels, appear. For indeed, by the passage of the aforesaid infolding, the conceptions of the Brain presently affect the Heart and its Vessel, and cause the rest of the Appendix, together with the Diaphragma, to be moved. Hence the motion of the blood and its inkindling in the Heart, together with the Pulse and Respiration, are altered: and for that cause, from the Heart being altered, not only impressions are retorted upon the Brain by the passage of the same nerves, but also the blood it self, its course being changed, drives to the Brain with a different or unaccustomed fluctuation, and so by moving the animal Spirits with various impulses, causes first one sort of conceptions, and then others to be produced: and so by reason of these reciprocal affections of the Heart and Brain, which are wont by a long series to be propagated vicissively, a multiplicity of thoughts and Phantasms arises. Hence both the ancient Divines and Philosophers placed wisdom in the Heart. Certainly the Works of Prudence and Vertue depend very much on the mutual commerce which happens to the Heart with the Brain: because, that cogitations about the acts of the Appetite or Judgment may be rightly described, it is behoveful for the flood of the blood to be restrained in the Breast, and the inordinations of it and of the Heart it self to be governed by the Nerves, as it were by Reins, and to be composed into requisite and apt motions. We might say more concerning this, but that this Speculation is from our purpose, and belongs more properly to Pathology or the Doctrine of the Passions of the Soul, in the meantime, we may refer hither one or two Observations taken from *Anatomy*.

When of late we had dissected the Carcass of a man that was a Fool from his birth, we could find no defect or fault in the Brain, unless that its substance or bulk was very small. But the chief note of difference which we observed between the parts of this man and of a man of judgment, was this, That the aforesaid infolding of the intercostal Nerve, which we call the *Internuncius* of the Brain and Heart, proper to man, was very small in this Fool, and beset with a weaker guard of Nerves,

Whilst we were writing these, we made an Anatomy of a Monkey, whose Brain differed little from that which is seen in a Dog or a Fox, unless that it was much more capacious in the proportion to the bulk of his Body, and the turnings and windings of it were larger. The orbicular Prominences called

Nates and Testes, also the ringy Protuberance, sent down from the Cerebel, came nearer the figure and magnitude of those parts in a man. But what occurred chiefly worthy noting, was this; *viz.* That the intercostal Nerve, although even as it is wont to be in other Brutes, being included in the same sheath with the Trunk of the eighth pair, was carried through the Neck, yet departing from this Nerve near the Chancel-bone, before it was inserted into the infolding, placed nigh the roots of the upper Ribs, did send forth some shoots into the Heart and its Appendix, and certain Fibres into the nerve of the Diaphragma: which perhaps partly is the reason, why this Animal is so crafty and mimical above other Beasts, and can so aptly shew and imitate, not only the gestures, but the passions and some manners of a man. But we will proceed to the explication of the intercostal Nerve from whence we have digressed.

We have already intimated for what use the Vertebral branch is inserted into its cervical infolding. There is the same reason for this as for the other Vertebrae, which communicate with the intercostal Nerve almost in its whole passage. But for that the nerve of the Diaphragma is radicated in the same Vertebral nerve, from whence a branch comes into this infolding, I say from that a reason may be taken, why the motion of the Diaphragma intimately conspires with the *Præcordia*, yea and with the conceptions of the Brain: which kind of Sympathy of the Diaphragma with the other parts, because it is requisite to be more strict and noted in man, it is observed, That not only the Vertebral branch cometh between the infolding and the root of the nerve of the Diaphragma, but two and sometimes three nerves are sent from this infolding into the trunk it self of the nerve of the Diaphragma, *Fig. 9. e. e.* Truly from hence not only the joynt action or *Symprix* of the Diaphragma with the *Præcordia* may be derived; but also the genuine cause is here manifest, why Risibility is a proper Affection of a man. For as often as the Imagination is affected by any pleasant or wonderful conception, presently the Heart desires to rejoyce, and as it were by shaking off its load to be eased: wherefore that the blood might be more swiftly emptied out of its right bosom into the Lungs, and consequently out of the left into the *Aorta*, the Diaphragma, instigated by the passage of the nerves going out of this infolding, is drawn upward by a more rapid *Systole*, and raises up the Lungs, as it were making iterated leaps, and causes them, by their more frequent striking together, to drive out both the Air and the blood. Then forasmuch as the same Intercostal Nerve, which communicates lower with the nerve of the Diaphragma, is continued also higher with the maxillary Nerves, a cackling being made in the Breast, with it the gesture of the Mouth and Face pathetically answers.

One or two noted shoots and many nervous Fibres are carried from this infolding into the returning Nerve, *Fig. 9. f.* Certainly the reason of this communication seems to be, that the Diaphragma and the Heart it self (into which nerves are sent from this infolding) might yet more conspire with the rough Artery (which the returning nerve affects) in its various actions; and especially in laughing, weeping, and singing. Moreover, when the returning Nerves, by pulling upwards the Trunks of the *Aorta*, cause the blood, for the stirring up some Affections, to creep more swiftly towards the Head, they may in the performing that office be much helped by the associate labour of the Nerves sent from this infolding.

From this infolding in the Neck many small fibres and shoots are spread into the sanguiferous Vessels, as also into the Coats of the *Trachea* and the *Oesophagus*, *Fig. 9. ibid.* As to what belongs to the former that respect the *Trachea* and the blood carrying Vessels; their office is, that they may respectively draw together and spread abroad those channels of inspired and expired blood and Air, according to the way and manner wherewith the Pulse and Breathing ought to be performed; whereby the motions of either might be the better retarded or accelerated, according to the necessities or requirings of the Heart. Then numerous Fibres are stretched out from this infolding into the Coats of the *Oesophagus* placed near, that by this means the admirable consent between the Heart and the Stomach, by reason of the Nerves being reached forth from this infolding and from the wandering pair to both, may be produced.

Concerning the Cardiac branches sent from this infolding, we need not discourse any more: after having but now intimated, that these were as it were *Internuncii* peculiar to men, which carrying to and fro the reciprocal impressions of the Brain and Heart, cause Commèrces in both Kingdoms. But forasmuch as Nerves of a double kind, *viz.* of the wandering and intercostal pair, respect the humane *Præcordia*, left the gestures of one should be different from those of the other, therefore the Cardiac branches, which are of either family, partly communicate in the same infolding, and are partly inoculated mutually by shoots sent forth before they are distributed into the Heart it self.

Below the Cervical infolding, the intercostal Trunk being demersed within the *Thorax*, admits three Vertebral Nerves arising higher, and constitutes the other infolding, which is commonly called the Intercostal, but more properly the *Thoracical* infolding, *Fig. 9. g.* In this place the intercostal Nerve being about to pass into its last and more large Province, *viz.* the *Viscera* of the lower Belly, and therefore seeking aid for the journey, and as it were a *Viaticum* for it self, it gets together in this infolding an increase or aiding forces from the Vertebral nerves, and afterwards receives lower others fresh nigh the several knots of the *Vertebrae*; because it will have need of a great stock of the Spirits, which it must bestow on the Mesenterick infoldings, and on other parts of the *Abdomen*.

That this Nerve about to enter the Thoracical infolding, doth bind the Chancel-bone Artery, *Fig. 9d.* and that the superior branch of the Vertebral, being sent into the same infolding, doth bind about the Vertebral Artery, *Fig. 9. n.* the reason of both seems, that the blood, for the uses and necessities of the lower *Viscera* (to which the intercostal Nerve from thence serves) may be driven forward with a more plentiful afflux downwards: which thing those Nerves easily do by pulling together the blood-carrying Vessels towards their infolding; so that they attempt this snatching of the blood in opposition to that which the returning Nerves perform. And indeed when the blood, tending upwards and downwards is wont sometimes to flow too much towards either bound, sometimes to be wanting; therefore the nerves, as it were an incitement or remora, are variously disposed both in the upper and lower region of the Circuit about the sanguiferous Vessels. After what manner this Thoracical infolding is in brute Beasts, shall be particularly shewn hereafter. The intercostal Nerve in a Man, both in this infolding and in the whole descent through the *Thorax*, receives many Vertebral nerves, as if sparing of its own stock, and greedy of anothers, but sends forth from it self not a shoot: whatever of Spirits is remaining either from the influence above, or comes to it by the by, is reserved wholly for a largess to be bestowed on the *Viscera* of the lower Belly. But after what manner, and by what passages of nerves that is dispensed into the several parts, we will unfold in the following Chapter.

CHAP. XXVII.

The lower Branching of the Intercostal Nerve belonging to the Parts and Viscera of the lower Belly is unfolded.

After the intercostal Pair hath past through the hollowness of the *Thorax* without any expence of Spirits, unless in the Neck-infolding, at length it sends down from the region of the Ventricle on both sides, a noted Branch; either of which presently becoming divided into two, constitute two peculiar Infoldings on either side; but one infolding arises in the midst of them, as if common to either side. Of the infoldings which are on the left side, one respects the Kidney, and the other the Ventricle with the Spleen; but of those which are on the opposite side, one respects the right Kidney, and the other the Liver and its neighbouring part. In the midst of these, the infolding proper to the *Mesentery* and the biggest, is placed as the Sun among the other *Planets*. Further, from these are sent forth one to another and into the neighbouring parts numerous Fibres very thickly, as it were dartings of rays. *Fig. 11.* plainly shews all these.

Concerning these, in the first place, it shall be inquired into in general, For what end so many nervous infoldings, with almost innumerable fibres and shoots, are distributed about the *Mesentery* and the *Viscera* of the *Abdomen*. For when in these parts the fibres and nervous shoots are carried on every side with so thick a series, that they are variously infolded with their manifold meeting; it may seem wonderful, if every one of these be destinated to some uses, and are not rather sprinkled here and there by chance, and as it were by the inconsiderate sporting of Nature. And indeed any one can scarce think, that so many Vessels should be prepared for the performing the offices of motion or sense in that place. For those *Viscera*, unless highly pulled and affected with a Convulsion, are sensible of little or nothing that we know of; and their motions are almost no other thing than obscure Vermiculations or light Corrugations, so that for the effecting them there is required no greater preparation than for the slow progress of a Snail.

Wherefore from hence it hath come into the mind of some, that a certain Juyce, and that perhaps nutritious, was dispensed by this manifold passage of the nervous Pipes: which sort of office however if assigned to these Fibres dispersed about the *Mesentery*, why should not the same office either of receiving or of carrying of nourishment, be granted to those in like manner divaricated about the Lungs and the *Præcordia*, and especially about the rough *Artery*? But truly it is highly improbable, that a nutritious Juyce should be contained in the Coats of the *Trachea* or of the *Bronchia*, which the nerves may suck out; nor does it more clearly appear, why more nerves should be destinated for the carrying of the alibile Juyce to these parts of the *Abdomen*, or those of the *Breast*, than is needful for the musculous stock. But in the mean time, though we deny, that the whole nutritious matter is carried this way and that way by those or the other nerves; yet we think, that within those nervous passages an humor doth perpetually abound, which may be for a Vehicle of the animal Spirits, and a Ferment for the nutritious matter: with which going with the nervous humor towards the Intestines and to the other sinks of the Body, it is likely, that the superfluous and excrementitious serosities do often slide down together, and so are carried out.

But it may be well thought, as to the Mesenterick Nerves, and Infoldings in which they are terminated, and the Fibres most thickly going out of these, that these different manner of Vessels are first Channels, then Storehouses, and lastly the last Emissaries of the animal Spirits. If it should be demanded, for what end so great plenty of Spirits should be designed for these ignobler parts; I say, that this is done for the performing the acts of Motion and Sense there, which are highly necessary for the preserving of life itself. For although local motion, which is always performed by the help of a Muscle, as of a Spring, is not convenient for the *Viscera* of the lower Belly; yet intestine motions are brought forth by them almost continually, and after many fashions: *viz.* for the subduing the Chyle, also for the separation of some parts and particles from others, both of that; and also of the bloody Liquor, and the protrusion of every one towards their designed bounds, the Fibres and nervous shoots reaching into the Membranes of the *Viscera* and the Coats of the Vessels, yea and into the textures of the *Parenchyma*, are variously drawn together, to wit, these are pulled upwards, those downwards; sometimes many together, sometimes apart or successively, are wont to be drawn hither and thither. In truth, it is a sign of the indiscontinued action of these *Viscera*, that as well in sleep, and perhaps more than in waking, the Culinary work of Nutrition is performed; and whilst the Organs of the other Faculties are at rest, there is no quiet granted to these: but that the Mesenterick nerves perpetually grinding in the Mill, are always-busied for the preparing the assimilable humor and the exporting the same towards all parts.

Moreover in these parts, to which the aforesaid Nerves belong, there is found an exquisite feeling no less than a motive Faculty; for whatsoever heterogeneous or hurtful thing, mixed with the Chyle or blood, is brought to any *Viscera*, presently the Spirits, inhabiting those parts, being warned of the evil, do greatly tumultuate as it were by entering into a Conspiracy, that what is hostile or troublesome they might shut out. But indeed, because the animal Spirits, flowing by the passage of the intercostal nerve to the Intestines and *Viscera* akin to them, proceed from the Cerebel; therefore the businesses of either Faculty, to wit, both the sensitive and locomotive, so far as they are performed the Brain unconsulted, and the animal scarce knowing it, are not so openly taken notice of, and for that reason they are accounted of less than the spontaneous acts of the other parts.

But as to the manner it self or way of the oeconomy, whereby the animal Spirits, destinated to the *Viscera* of the lower Belly, are exercised, we affirm, That plenty of them flow into all the Mesenterick infoldings by the passage of the nerves sent from the intercostal pair; where being heaped up to a fulness, as it were in so many Storehouses or places of Receipt, they are kept to be distributed from thence into several parts, as occasion requires. But that the Spirits flow out of these infoldings, not through singular and larger branches, (as is done in the Muscles) but as it were by Troops of Fibres, into their proper tasks, the reason is, because here the business is performed otherwise than in the muscular stock. For where a Muscle is fixed to the part to be moved, its implanted Fibres perform the whole work of Contraction, or of the motive endeavour; but it suffices for the nerve still to convey new supplements of Spirits, and as occasion serves, the Instincts of the Motion to be performed: but in the Membranes and the *Viscera*, where Muscles are wanting, the nervous Fibres themselves most thickly implanted, and distributed as it were so many little ropes, almost into every part of the subject, perform the business of Traction or drawing by themselves and their own proper endeavour or force partly; and partly solicit or stir up into motion the Fibres implanted in the *Viscera* disposed after an uncertain order; which they determinate in their action, and moderate or govern them, as it were so many fingers laid upon the strings of a musical Instrument. For although the Membranes and the *Viscera* themselves are indued with some implanted Fibres; yet these are not, as it is in the Muscles, of one kind and position; but in the same part some are straight, and others oblique or crooked, these tend upwards, those downwards, and others are carried round; so that divers sorts of motions ought to be performed in the same Membrane or Inward, sometimes together, sometimes successively or by turns: wherefore distinct nerves are required, not only for the several series of Fibres, but for all the parts of the subject, to wit, which may stop here a motion begun in that place, and may begin another anew, or may unite one with another. Truly the motion which is performed in the muscular stock seems like the rude and more simple work of some Weaver, where the Shuttle being always cast after the same manner, the Woof is laid under the Thread or Yarn: but the motions of the Intestines and *Viscera* may be aptly compared to a Texture very much variegated or flourished, for the weaving of whose more artificial substance or making there is made use of many hands together, or of a Machine diversly turning about, and furnished with more than a thousand sorts of motions.

Concerning the many Mesenterick Nerves, and Shoots, and nervous Fibres which go out of them by bands, we must consider chiefly these two things: to wit, what may be the office of each of them for the stirring up of motion or sense, either of them, or both together in any part: then secondly, what the communication of either of them may be with other nerves, infoldings or bundles of nerves, by reason of which a Sympathy or consent of actions arises at once in divers parts. According to these two respects, we will particularly weigh now the several nervous Vessels belonging to the *Viscera* of the lower Belly.

Therefore in the left side the supreme Mesenterick branch being presently forked like the figure of the Letter Y, contains in its upper shoot the Stomachical infolding, which is also the Splenetick, and in the other lower the Renal infolding or that belonging to the Reins. Moreover, about the

the knot of division it sends forth some shoots to the greatest infolding of the Mesentery, *Fig. 11. F. G.* Hence a reason is plain, wherefore there happens such affinity between the Ventricle and the Spleen, and between the Mesentery and the Reins, so that the very often and familiar Symptom of Vomiting is both in Splenetick, Colical, and Nephritick people: because when a Convulsion is begun in any part or Inward, which the Mesenterick nerve respects, presently other parts, to which the infoldings or shoots of the same nerve belong, are drawn into consent.

From this lower infolding a little bundle of Nerves being carried towards the Stomach, inserts its Fibres partly in its bottom, and partly sends them to meet with other Fibres sent down from the nerve of the Stomach, *Fig. 11. n.* The reason of the former is, That whereas there are many Coats of the Ventricle, and divers series of Fibres are disposed in them, for the actuating all of which with a due influx of animal Spirits, the Stomachical nerves, derived from the wandering pair, are not sufficient; it was fit, that for the outward Court as it were or Precinct of this Inward, to wit, for the outmost bottom of it, some forces of Spirits might be supplied from some strange Kingdom, to wit, from the aforesaid nervous infolding of the Abdomen. Instead of this, Spirits also may slide downwards from the same Stomachical branch through other Fibres sent down, and be sent into this Splenetick infolding. Besides also it is observed, That the adventitious nerves aptly conspire with the former, being of the proper dominion of the Ventricle, and that either are not only inoculated within the confines of the Inward it self, but they run into mutual embraces without it, and as it were joyn hands together.

It seems plain, that the nervous Filaments being carried from the aforesaid infolding to the bottom of the Ventricle, may serve there for the performing the acts of Motion and Sensation: but it doth not so easily appear with what office the other handful of Fibres reaching out from hence into the Spleen is charged (*Fig. 11. Z.*) because this Inward is said to be destitute wholly of every animal Faculty. When we did elsewhere inquire into the use of the Spleen, we thought good to affirm, That its office was to separate the dregs of the Blood and the acid-saline Particles, and whatsoever were of a more fixed nature, and to concoct them more being received into its own bosom, and to convert them into an acid Ferment, by which being again delivered to the blood through the Veins, a sharpness and an asperity, as also an active or fermentative virtue are gotten for its *Latex*. Wherefore the whole substance of the Spleen consists of a texture of Fibres in the form of a net; to wit, that the Feculencies of the blood might be more plentifully received, and contained within its spongy cavities and thick passages. I say therefore, that for the fit preserving and dispensing of the Splenetick Ferment, besides the Arteries which carry matter, and the Veins which continually sup back some portion of the same fermented, there seems to be need of many nerves also, which both by pulling the fibrous texture of the Spleen, might cause the melancholick and dark *Fæces*, laid up in it, to be shaken together, and so by defending it from putrefaction and coagulation, cause it to be imbued with an acid and fermentative nature; and also that those nerves may sometimes draw together and constrain the blood-carrying Vessels, sometimes open and enlarge them; that as occasion serves, the Feculencies of the blood may be sometimes more plentifully, sometimes more sparingly laid aside out of the Arteries into the Spleen; also that more or less of the Ferment, preserved in the Spleen, may be poured out on the blood according to the requirings of the Passions or of the natural Instinct. No Hypochondriack but doth abundantly perceive, that some Splenetick nerves do perform motions: for those great perturbations which are wont to be excited in the left side, as when sometimes Inflations, sometimes constrictions of the inward parts, and sometimes various concussions are perceived with a wandering pain running here and there, they are only Spasms or Convulsions or wrinklins together, with which the nerves of the Spleen are ordinarily affected. Nor do its nerves, taken with a Convulsion, stir up tumults only in the neighbourhood of the Spleen, but oftentimes further into the Heart it self, yea into the whole Body the effects of their inordinations are carried. I have known an Hypochondriack, who presently upon the Spleen being disturbed, seemed to have his *Præcordia*, being drawn downwards, to be cruelly prest and bound together; so that being very sad and dejected in his mind, also complaining of an exceeding great straitness and constriction of his Breast, he thought himself almost dead. The cause of which kind of distemper was without doubt, that when many Fibres going out of the Splenetick infolding are united with the other Fibres sent from the farthest end of the wandering pair, it easily happens, that the former, being distempered with the Convulsion, do draw together and pull downwards their yoke-fellows, and by consequence the Trunk it self of the wandering pair, from which the nerves are sent into the *Præcordia*: certainly by the *Sympaxis* or joyn't action of either kind of the aforesaid nerves, viz. where of these respect the Spleen, those the *Præcordia*, it is effected, that the Trembling Oppression, and other grievous Distempers of the Heart, as also of the Spleen, so ordinarily happen. Further, forasmuch as the Fermentation of the blood depends on the Spleen, according to the influence of this, that perform its Circulation, sometimes pleasantly, sometimes disturbedly. Whilst the Spleen is at quiet, and free from any perturbation, the blood also is quietly moved in Hypochondriack persons; but if the same be moved and exercised, (as it is wont to be in any passion or violent motion of the Body, or by a Medicine) presently its nerves being distempered with a Convulsion, shake it more with reiterated contractions; so that the fermentative Feculencies, being shaken out of its bosom, flow back more plentifully into the blood, which cause its *Latex* presently to be troubled, and as it were muddy, and sharpen it with so great acrimony and mordacity, that it burns and pricks the Brain and Heart like needles; from whence in Splenetick people besides that the Reason is obscured, the affections of the Mind, especially Sadness, Hatred, and Anger are very much increased.

Concerning the Splenetick Nerves, by another conjecture, we are yet brought to believe, that they, beſides the exerciſe of the motive Faculty, do both inſtil into the Spleen its own humor, which promotes the fermentative virtue of that Inward; and alſo (becauſe the nerves, as was ſhewn already, convey the Spirits, and ſometimes the humors by either way, viz. forward and backward) the ſame implanted in the Spleen, do often imbibe from it an acetous or Vinegar-like humor, and as it were Vitriolick, from whoſe acrimony and notable twitching, they are forced into Convulſions.

But forasmuch as the nervous Infolding reſpecting the Spleen, communicates more nearly with the Ventricle, Meſentery, Liver, and Kidneys, and more remotely with the *Præcordia* and other parts placed at a diſtance; from hence the cauſe is plain, wherefore not only theſe ſeveral *Viſcera* and parts, by reaſon of the fault of the Spleen, are folded together; but alſo on the contrary, why the Spleen being indiſpoſed by any Diſeaſe, or trouble raiſed up in any of thoſe parts, is wont to be diſturbed: ſo it is not altogether for nothing, that the Symptoms every where infeſting, the cauſe of them being unknown, are aſcribed ordinarily to the Spleen; becauſe it fixes not only its own inordinations in other parts, but alſo ſuffers for their peculiar faults: which notwithstanding is wrongfully aſcribed to Vapours tranſmitted from this or that part, when the formal reaſon of every Diſtemper of this kind for the moſt part conſiſts in the communication made through the Nerves.

The lower Infolding of the left ſide ſeems to be made for the Kidney placed near, into which chiefly the bundle of its Fibres is carried; *Fig. 11. 4. γ. γ.* Certainly that theſe nerves, following the emulgent Veſſels, do embrace the ſame, and bind them about with a various and frequent complication; that is ſo made for that end, that by reaſon of the Artery being ſo ſtrained and frequently ſhaken by the drawings of the nerves, the Serum may the more eaſily be precipitated from the blood; wherefore it is obſerved in very great difficulty or danger, when the mind and all the nerves are ſtrained for fear, that a frequent and more plentiful making of water, and that often painful, is wont to be provoked.

The Renal Infolding receives, beſides the Nerve common to it with the upper infolding, another new and peculiar one from the intercoſtal nerve, or rather that coming between from the ſpinal Marrow, *Fig. 11. β.* Hence it is, that the Loyns have a great conſent with the Reins, and ſuffer ſo ordinarily for their Diſtempers with a grievous and largely diffuſive pain. Forasmuch as this infolding communicates with the greateſt of the Meſentery, the Colick diſtemper and the Nephritick are much akin, and it is often difficult to diſtinguiſh their ſits one from the other.

The Meſenterick branch in the right ſide, as well as the left, being forked, contains two infoldings: the upper of theſe (which we call the Hepatick) ſends forth from it ſelf many little bundles of nervous Fibres; the greateſt of which being carried towards the Liver, cloaths the Hepatick Artery as it were with a Net made of Fibres, *Fig. 11. δ. ο.* The moſt Learned *Gliffon* obſerves, That the Hepatick Artery is beſetwound on the Trunks of the Veſſels; to wit, of the common Cheſt, of the biliary Pore, and of the *Vena Porta*; for the watering of which, and for the actuating them with heat and nourishing Juyce, it carries the arterious Blood; to which notwithstanding for the recarrying, an aſſociate Vein is wholly wanting: wherefore that ought to carry the blood, not with a full and free influx, but by little and little, and always in a conſtant meaſure to thoſe membranaceous parts: for otherwiſe there had been danger, left from the bloody *Latex* plentifully ruſhing forward, for that it could not be ſtill remanded preſently through the Veins, an Inflammation ſhould be excited, or left from its torrent being tranſuſed beyond its bands, the courſes of the other rivers in the Liver ſhould be diſturbed. But for that the nerves, like Reins, do bind about the Trunk of the Artery, the inſtreaming of the blood it ſelf is moderated, and they cauſe it variously to be diſpenſed according to the wants of thoſe parts to which it is deſtinated.

From the Troop of Nerves going out towards the Liver, ſome bend down into the *Pancreas*, and others into the *Cholodock* Veſſels, *Duodenum*, and *Pylorus*, and ſow into them thick ſeries of ſhoots, *Fig. 11. π. π.* The office of theſe ſeems to be, to pull together the excretory paſſages of thoſe parts, and to ſhake them for the cauſing Evacuations of the boiling or turgid humors upon occaſion. Further, from theſe Fibres being carried upwards, when many others ſent from either Stomachical nerve are united, the reaſon is plain, why from an hawling or pulling made about the Ventricle, the yellow Bile is drawn out of the Gallcheſt into the *Duodenum*, which being carried from thence into the Ventricle, by reaſon of a Convulſion of that ſame Inteſtine, is caſt up by Vomit: becauſe the Stomachical nerves being irritated by a Medicine, or by any troubleſom thing, for the making an Evacuation above, and for that cauſe drawn from thence upwards, they draw together the nerves belonging to the Liver and the *Cholodock* Veſſels, for that they are tied to them, and bring them into conſent with the ſuperior Spasm or Convulſion. Hence it happens, that not only the Stomach being firſt tired, draws to it ſelf the Bile by its Convulſion, and allures it into its own boſom; but the Bile alſo of its own accord growing turgid, and ſo being poured out into the *Duodenum*, forasmuch as it irritates the nerves of this Inteſtine, and then by their conſent, provokes the nervous Veſſels of the Ventricle, it preſently induces a cholerick Vomiting.

The Hepatick Infolding communicates with the Splenetick by Fibres going between either, *Fig. 11. θ.* The reaſon of which ſeems to be, That when one infolding reſpects the end or the right extremity of the Ventricle, and another the left; that a conſent in either and a joyned action may be made towards the Stomach, both communicate between themſelves by nerves, as if *Internuntii*. Truly it ſeems to come to paſs by the paſſage of theſe nerves, that the *Hypochondriacal* pains oftentimes run from the left ſide

into the right; to wit, for that a Spasm or Convulsion begun in the Splenetick infolding, is wont to be carried to the Hepatick.

Between the *Hepatick* Infolding and the greatest of the *Mesentery*, many Fibres reaching out by bands, are cast out in the midst, *Fig. 11. p. p.* the office of which is to sustain a certain commerce and Sympathy; to wit, such an one is required, both that the Chyle may be ministred from the Intestines towards the Liver still in due proportion, also that the Bile may opportunely slide out from the Gall-bladder into the Intestines for the provoking of Excretion. For we are of this Opinion, That the Meseraick Veins sucking out a certain portion of the Chyle from the Intestines, immediately transfer it through the region of the Liver into the *Vena Cava*, whereby the blood in the ascending Trunk of the hollow Vein or *Vena Cava*, might be freshly imbued with nourishing Juice; even as in its descending Trunk it is refreshed, the same being poured out through the *Thoracical* Vessels or those belonging to the *Thorax*. Wherefore it is needful, that there should be a very strict affinity between these *Viscera*; and the rather, because the Bile ought to be poured out from the Gall chest to the Intestines, not continually, but for some uses, by occasions and intervals. For the Nerves knowing best the wants of either part, warn them both of their mutual duty, and as occasion serves, stir them into action.

It is observed, That in the right side an ample Nerve is stretched out between the *Hepatick* and *Renal* infolding, *Fig. 11. p. p.* So that between these infoldings a greater and more immediate consent is had, than between those pairs of the other side. The reason of which doth not easily appear, unless perhaps it should be so made for this end, that when from the Reins; in making of water, there is an endeavour of the serous Excretion, the *Pylorus* and the *Cholidock* Vessels being at once drawn downwards, a protrusion of the Chyle and *Feces* might be provoked towards the lower parts of the Belly. Certainly this connexion of these infoldings is chiefly the cause, why oftentimes most cruel Vomiting uses to come upon a Fit of the Stones; and that from such a Vomiting the *Cholidock* Vessels are very much emptied, as if provoked by taking an Emetick.

The greatest Infolding of the *Mesentery* being placed in the midst of the rest, like the Sun, disperses every where round about nervous Fibres like rays, *Fig. 11. o.* and casts them not only on every one of those infoldings, as if so many Planets with a peculiar Aspect, or *Alinobolism* or Irradiation, but also it distributes them into many Intestines, sanguiferous Vessels, and other parts lying round about: without doubt upon these nervous Filaments, which are carried from this infolding to the Intestines, as Lines from the Centre to the Circumference, every action of the Intestines, and especially the Peristaltick motion of the Vermiculation, depends; namely for that these Fibres do move successively, and still move further every begun action, as it were with a spiral or Screw-like progress.

That from this Infolding many Fibres and shoots going forth, are inserted into the Trunk of the *Aorta* nigh its descending, and that these reaching towards the Intestines, accompany the Blood-carrying Vessels, and in several places climb over them; from hence it may be inferred, That nerves also in the Abdomen are like Bridles and Reins cast on the sanguiferous Vessels, which either by straining or pulling them together, may sometimes retard, sometimes incite the course of the blood according to the needs of the lower *Viscera*.

From the greatest Infolding of the *Mesentery* some noted Fibres and shoots are sent out into the *Glandula's* of the Womb or the Womens Testicles, *Fig. 11. t. t.* Into which also other shoots from the Trunk of the intercostal Nerve, *ibid. v. v.* and others going out of the nerve which comes between this infolding and the lowest of the Abdomen, do come together, *ibid. j. j.* So that a provision of Spirits is carried into those parts from a threefold Store-house; which indeed is much larger than is done in the other Sex, when we find scarce any nerve to belong to mens Testicles. Indeed the Womb, besides that it is a very sensible part, ought also to be moved diversly, and in bringing forth a child very strongly: wherefore there are granted to this both more strong implanted Fibres, and also Nerves of a various kind and original.

Most of the Infoldings of the Abdomen, but especially the lowest, and that related to it the greatest of the *Mesentery*, are oftentimes affected in the Passions commonly called Hysterical, as shall be presently declared. Therefore if at any time such distempers proceed from the Womb, the cause is manifest wherefore the aforesaid infoldings are drawn into consent. But we have elsewhere shewn, That those Passions are merely convulsive, and not seldom excited without any fault in the Womb. Further, that Symptom very frequent in those kind of Fits, to wit, in which as it were a Globe is perceived to be carried from the bottom of the Belly, and about the Navel to leap out impetuously, which therefore is thought to be an ascent of the Womb; I say, that it is nothing else than most cruel Convulsions of these infoldings. Indeed oftentimes in Women, and sometimes also in Men, I have known when the convulsive Affection hath invaded, that a bulk in the *Hypogastrium* hath been seen to arise, then about the midst of the *Abdomen* so great a swelling to follow, that it could not be hindered or prest down, though strongly attempted by the hands of a strong man. Without doubt, the cause of this admirable distemper is, that within the nerves of the intercostal pair the inflowing animal Spirits, as often as they beign disorders or convulsive motions, first (as it is wont to be) begin to grow hot or to be exploded about the extremities of the nerve, to wit, in the lowest infolding of the *Abdomen*; which affection of theirs, when creeping upwards it is carried to the greatest infolding of the *Mesentery*, so that the Spirits inhabiting it are taken with the like inordination, it is no wonder, if that swelling up of the middle of the *Abdomen*, and as it were an explosion of a certain nitrofulphureous matter, should be stirred up. For truly it is not probable,

probable, that that Symptom should be excited from the Womb ascending and being removed from its place, because, besides this part being fixed in its place and firmly established with Ligaments, the bulk of it also in Virgins is so small, scarce exceeding the bigness of a Walnut, that although it should be carried up into the Belly, it could not produce such a swelling. Nor is it more likely, that this sort of distemper is stirred up from the Muscles of the *Abdomen* taken with a Convulsion: for they, however convulsive, draw together themselves and subjected parts upwards or downwards, or of one side, but they are not able by any means to bear themselves aloft, and to lift up on high, with a force, the region of the Navel. But, as we suppose, the animal Spirits in the greatest infolding of the Mesentery growing fierce, and becoming apt to be exploded, (as such indeed they are whenever they enter into convulsive motions) they being there gathered round thickly into a Globe, do mainly blow up and lift on high with their effervescency and notable rarefaction that infolding with its whole neighbourhood, and at once drive upward the *Viscera* lying upon it with a certain vibration or shaking. A more full explication of this Symptom belongs to the Pathology of the brain and Nerves.

In the mean time we shall take notice, that another certain Distemper, *viz.* the *Colical* grief doth belong to the infoldings of the *Abdomen*, and especially to this greatest of the Mesentery. For it may be thought, that the most cruel torments that are wont to be excited in this disease do come, not from an excrementitious matter shut up in the cavities of the Intestines, nor always from a sharp humor in packed in their Coats, but oftner from the nervous Juyce imbued with a certain acrimony, and stagnating within this infolding; from whence, by reason of a consent of this with the infoldings both Hepatick and Splenetick, a frequent and cruel Vomiting comes upon these pains. But these *Pathologic* Speculations being referred to their places, we will follow what we first of all instituted, the further passage of the intercostal Nerve, by which we are led to the two lesser and lowest Infoldings of the *Abdomen*.

Below the Mesenterick Nerves, out of which the superior Infoldings are made, either descending intercostal Trunk sends forth three or four singular shoots, which are carried into the Ureters, *Fig. 11. v. v.* The use of these seems to be, to pull together, and to jog or shake those urinary Channells, that the Serum separated in the Reins, may be the more readily drawn out towards the Bladder. Moreover, if at any time a viscous or muddy matter doth stick to the passages of the Ureters, or a more fixed stone doth obstruct their Cavities, they, by the help of the Nerves inserted here and there in their whole tract, being pulled together and wrinkled, may press down and always move forward any bulk or substance staying in the passage.

Nigh the *Vertebrae*, out of which the Crural Nerves begin to go forward, three distinct branches brought to either intercostal Nerve, are carried from thence into the lowest hollowness of the Belly, where they make the infolding which is the lowest of the *Abdomen*, *Fig. 11. d. d. d. d.* That here so many nerves, to wit, six large ones joining together do make but a small infolding, *viz.* a lesser than is raised higher in a single branch of the nerve; the reason is, because this infolding is like an Inn, where the infolding Spirits dwell no long time, but it receiving them only in their passage, presently commits them to other infoldings placed here and there above, below and of one side, and made for divers offices; for from hence the chief passage, and as it were a broad way, leads to the greatest infolding of the Mesentery; moreover, from hence nerves, diversly going out, make three other infoldings, which respect the parts and ways by which the several Excretions, to wit, of the Dung, Urine, and Seed are made in the lower Belly.

The first Nerve therefore sent out of this lowest Infolding into the greatest of the Mesentery, a little before it reaches to it, imparts two noted shoots to the Glandula's of the Womb; but in its ascent it admits four other branches, as it were subsidiary, *viz.* two on either side from the intercostal pair, *Fig. 11. x.* so that the nerve here seems to be the chief means of passage of the animal Spirits destined to the greatest infolding of the Mesentery and to the uterine Glandula's; which passage however is carried into the designed parts, not immediately; but a compass being made, it first goes forward beyond its bound, and at length with a certain going back. The reason of which is, that the motions of all the Intestines, *viz.* the Vermiculations should be directed downwards towards the straight Intestine, and also that the actions of the Womb should tend thither; therefore 'twas fit, that the animal Spirits should be supplied from below whither the motion inclined. For by the like means, this Mesenterick nerve and the two returning nerves, being first carried lower, ascend into their Provinces; to wit, that they may pull together the respective parts toward that bound placed below, as it were to a Pulley.

Further, for this end, to wit, that the influence of the Spirits actuating some Intestines, might be derived lower; the other infolding of the *Abdomen*, to wit, the least, is added immediately to this. Because upon the Nerves being carried from hence about an inch, there grows a small infolding; out of which, one nerve being sent out into the greatest infolding of the Mesentery, stretches it self under the top of the straight Intestine and part of the Colon, *Fig. 11. g. a.* And another nerve, descending from this infolding, is carried under the lowest part of the same straight Intestine, *Fig. 11. b.* which also, two shoots carried from the infoldings placed in the Pelvis or Basin, meet, *Fig. 11. d. d.* It will not be hard to declare the uses of this infolding and its nerves: because all those nervous passages are emptied about the offices and motions of the straight Intestine. The ascending nerve directs the Vermiculations of the same straight Intestine, as also of the lower part of the Colon, and then (the greatest infolding of the Mesentery mediating) of some other Intestines to be made downwards; but the descending nerve, in opposition to the other, drawing the lowest part of the straight Intestine upwards, takes care that the Excrements being

being carried towards the Arse-hole, may not slide out suddenly and unexpectedly. Then forasmuch as two nerves from the two infoldings placed within the Basin or Tunnel, (which infoldings immediately admitting a noted Vertebral branch, are partakers of the spontaneous Function) meet with this descending nerve, and are ingrafted into it; it comes to pass from all of them together, that the Excrements being detained at the doors, when it shall be convenient, the Appetite commanding are cast out. Nature, that it might shun filthiness, is so careful, that for the carrying out of the Excrements it constitutes nervous Vessels, with as noted a provision, as for the performing any where of the most splendid offices.

From the lowest Infolding of the *Abdomen*, two nerves being sent into the Tunnel, receive there on both sides a noted Vertebral Nerve; and so constitute two infoldings, to wit, one in either side, *Fig. 11. CC. KK.* These infoldings near the doors, placed before the chief excretory passages, serve for the opening and shutting them: a Vertebral branch comes to either as a supply; by which it comes to pass, that besides the increasing the forces of the Spirits, their acts flowing from these infoldings, become in some measure spontaneous. By what means and for what end, the nerve ascending from either infolding, is bestowed on the straight Intestine, was shewn but now. Moreover, two descending on both sides, are carried into the neck or porch of the Womb, *Fig. 11. e. g.* Without doubt, whatever of sense or motion is made about the Venereal acts, is owed to the influence of the Spirits through these Nerves. In Men the delightful provision of the Genital humor, and in Women the no less pleasant reception of the same depends on the action of those nerves. Lastly, from the same infolding another nerve descending and broken into certain shoots, is distributed on both sides into the Bladder and its Sphincter, *Fig. 11. f.* Certainly by these nerves the business of making water is performed, and when at any time the same is painful, the troublesome sense is impressed on them. But forasmuch as the nerves dedicated to the several Excretions proceed on both sides from the same infolding, therefore the acts of them all are in some measure alike among themselves, so indeed, that if any excretory passage should be weak or ill affected, it sends forth its charge which it should keep, whether it will or no. This is so well known, that there is no need to illustrate the matter with instances.

These Nerves and Infoldings being so made, there is not much business besides left for the intercostal pair. About the beginning of the *Osfacrum*, both Trunks inclining mutually one to the other, communicate among themselves by a cross shoot, or two, then they end in very small Fibres, which are distributed into the Sphincter of the *Anus*, *Fig. 11. q. r. s.* Here the intercostal pair is after the same manner, as we have observed concerning the wandering pair; to wit, either nerve being brought to the end of its course, before they enter upon their last task, incline themselves to mutual embrace. Concerning the last offices of either pair, this Conformity may be also noted; that whenas the *Viscera* dedicated to Chylification, to wit, the Ventricle and Intestines, are still continued to the last by the same passage and the same perpetual cavity or hollowness; the first doors of this Cavity, to wit, the Orifices of the Ventricle, are kept by the lowest branches of the wandering pair joyned among themselves; but before the last door of the same, to wit, the Sphincter of the *Anus*, the extremities of the intercostal pair, also before joyned among themselves, are placed. But to this part, as if it had never provided enough for it, besides the nerves sent hither from either infolding next above, and these extreme productions of the intercostal pair bestowed on it, a branch also and certain fibres from the Vertebral nerve are inserted, *Fig. 11. i. k.* By the access of which it comes to pass, that the shutting and opening of this door-keeping Muscle becomes spontaneous. Truly many nerves, and those of a diverse kind, are distributed into the Sphincter of the *Anus*, to wit, because the nutritious Juice and its stinking recrements, like a certain Chymical matter, are digested within the Intestines, as it were within a *Matrice*; therefore Nature, which best understands Chymistry, is very careful about the well-stopping the mouths of the Vessels.

From the same Nerve, *viz.* the last Vertebral, out of which a branch disperses fibres into the Sphincter of the *Anus*, two other Nerves proceed, which are carried into the Yard, *Fig. 11. l. m.* The greater of these, which is very large and long, is distributed into the nervous Body of it; the other lesser, into its Muscles. This member, because it receives nerves only from the spinal Marrow, according to our Hypothesis, ought to swell up and to be moved only at the spontaneous pleasure of the will: but that oftentimes, by reason of the swelling up of the Genital seed or humor, it is erected and blown up with Spirit, whether one will or no, that is caused chiefly for this reason, because from this Vertebral pair from whence the nerves of the Yard arise, a nervous process is stretched out into the Vertebral pair next above it: in which the infolding, placed in the Tunnel, imparting nerves to the *Prostate*, is radicated, *Fig. 11. I. K.* into which infolding also a noted nerve from the intercostal pair is implanted. When therefore a communication is had between the *Prostate*, which depend much on the intercostal Nerves and the Yard, (by reason of the roots of either being joyned together by the nervous process) it comes to pass, that the action of this follows the affection of those parts; but those parts, *viz.* the *Prostate*, are apt to be moved, not only by the turgescency of the Seed, but also by the passage of the intercostal Nerve are wont to be irritated with too unseasonable an action, according to the impressions made by the Senses or the Brain; into the consent of which presently the Yard is excited.

Concerning the Nerves which belong to the Testicles, here is not much to be spoken; for we have often sought in vain for a great company of nervous passages in them: I have very diligently searched sometimes in Man, also in a Fox, Dog, Calf, and likewise in a Boar and Monkey, but could never find belonging to them but one nerve carried from the Vertebral pair, which also for the most part is bestowed on

the Cremasteral Muscle, *Fig. 11. M.* so that, although an excellent humor is prepared within those parts, yet it doth not easily appear, that its matter is derived thither through the nerves; for we think the Genital humor is no more dispensed by the nerves than the nutritious. For truly it seems, that the Arteries infill a spirituous liquor into the Testicles after the same manner as in the Brain; wherefore in their neighbourhood these sanguiferous Vessels being very much divaricated or spread abroad, are turned about into little serpentine chanel, whereby they subtilize the humor destined to the Testicles, and insinuate it, having put off all thickness and Feculency, and being truly sublimated, into their substance; because there, as within the Cortex of the Brain, the spirituous liquor being imbued with a volatile Salt implanted in the part, passes into the most noble *Clyffus*, viz. the Genital humor. But here is not a place to discourse more largely of the nature and origine of the Seed: yet because it is commonly objected, That the Seed is made of the nervous Juice and plenty of Spirits fetched from the Brain, and therefore a large expence of it doth induce quickly on the Brain and Nerves a great debility and enervation; I say, this comes to pass, because after great profusions of the Seed, for the restauration of the same humor, (of which Nature is more sollicitous than for the benefit of the individual) presently greater Tributes of the spirituous Liquor are required from the blood to be laid up into the Testicles: wherefore the Brain is made languid, being defrauded of its due stock and afflux of the same spirituous liquor; and the Spirits influencing it and the nervous System, because they are deficient in the Fountain it self, are very much depauperated and become flagging. Besides we may add, That the animal Spirits also which actuate the *Prostate* coming from the spinal Marrow, are consumed about the Venereal acts very much; so that the Loyns are also enervated for this reason.

CHAP. XXVIII.

Of the Spinal Nerve an Accessory of the wandring Pair; also of the Nerve of the Diaphragma.

After we have unfolded the Nerves of the wandring and intercostal pair, which being Executors of the involuntary Function, are stretched out to the *Præcordia* and all the *Viscera* of the middle and lower Belly, and also to some other parts: Next to these follow some other Nerves communicating with the aforesaid in the beginning, or in the exercise of the same office, viz. the spinal Nerve and the Nerve of the Diaphragma; of which we will speak in order.

We have already shewn, that the Nerve of the wandring pair in the beginning is made up of numerous Fibres: to which is joynd another noted Nerve arising from afar, and being ingrafted with them, goes forth together with them out of the Skull. Concerning this Nerve, because the beginning and distribution of it being very irregular, have not as yet been noted by other Anatomists, it may seem worth our labour to make a little more diligent inquiry. Therefore if we would search into the beginning of this nerve, that is found beginning with a sharp point in the side of the spinal Marrow nigh the sixth or seventh *Vertebra* of the Neck, *Fig. 12. C. C.* But being increased in its ascent, is nowhere inserted into the medullar Trunk, but in its whole tract on both sides lean on its side, to which it is knit by certain admitted Fibres towards the superficies. This arising up from the Neck after this manner, and being carried within the Skull, is joynd to the Fibres of the wandring pair, and is ingrafted with them seeming to grow together into one Trunk, and goes out with them at the same hole from the Skull; which being passed through, the spinal Nerve presently departing from the Trunk of the wandring pair, is at length reflected outward, *Fig. 9. 2. 3.* This stranger or travelling nerve after a short commerce having left his companion, is carried upon the Muscles of the Neck, to which it imparts some shoots, and is inoculated with a certain shoot of the tenth pair; but from thence being carried on further, it goes alone by a long passage, till it comes to the Scapular Muscle, on which it is almost wholly bestowed, *Fig. 9. 2.* This nerve is found constantly, not only in Man and four-footed Beasts, but also in Fowls and Fishes; and in these it seems to be destined instead of Arms, and for the moving of their wings and fins.

Concerning the use of this Nerve, and the reason of its irregular beginning, we shall conjecture after this manner: Forasmuch as that is destined for the performing the motions of the Muscles belonging to the Arms and Neck, therefore it ought to arise out of the spinal Marrow: but that it is not carried by a direct and near way into its Province, but being carried about by a long compass before it enters upon its task, communicates in its beginning with the nerve of the wandring pair; certainly this seems to be done, to the end that this Spinal nerve, being carried into the parts of the wandring pair, might perform the acts of the Function only involuntary. And indeed it may be observed, That besides the spontaneous motions wherewith the Neck and Arms are wont to be employed with the previous intention of doing this or that thing, those parts also, before any other member, are affected with pathetick and sudden motions,

ous, according to the force of the Passions, the animal not being conscious of it. For almost all living Creatures do not only turn about their necks at any noise to behold whatever might cause fear; but they being any ways affrighted, in the twinkling of an eye fly away, their feet, wings, fins, or other part answerable to them, being set into a rapid motion. The Neck and the Arms are pliable or observant, not only to fear, but in like manner to the other Passions. For brute Animals, as well as Man, being puffed up with pride or anger, (as we have elsewhere intimated) have their Necks swollen, and their Crests lift up: But as to Man, his hands and Arms are so obsequious to the Passions, and almost to all the conceptions of the Brain, that they are continually agitated in the doing of any other thing with various gestures, whereof we are ignorant or not willing them: we scarcely think or speak any thing but at the same time the hands are flung out here and there; and whilst the Tongue hesitates or sticks, or the words as it were stick between the Jaws, the right hand is exercised, as if by its gesture it were endeavouring to draw out more swiftly the sense of the mind. Truly that these parts, to wit, the Hands and Arms, do so nearly conspire with the Affections of the Brain and Heart in their motions in some measure in all living Creatures, but more eminently in Man, the cause seems to be this nerv's coming from the spinal Marrow to the beginning of the wandering pair, and communicating with its nerves, and receiving from them as it were the note or private mark of the involuntary Function.

So much for the spinal Nerve, which also like a shrub, growing from other shrubs, hath no peculiar origine, but having received various fibres, is radicated for the greatest part in the spinal Marrow, and (as hath been shewn) partly in the nerve of the wandering pair. Concerning the nerve of the Diaphragma, of which we shall speak next) many things occur no less worthy remarking. As to its beginning, it may be observed, That it arises from the brachial nerves with a double or triple root; to wit, two or three shoots going out of the aforesaid nerves, grow together into the same Trunk, which is the nerve of the Diaphragma. In man its first shoot, which is also the greatest, is produced out of the second Vertebral nerve; and when the first brachial nerve arises from the same handful of Vertebral nerves going out at this place, the aforesaid shoot is rooted in its origine: wherefore, when in Brutes the first brachial nerve arises from the fourth or fifth Vertebral, the nerve of the Diaphragma also begins its rise far lower: two other shoots arise out of the same stocks of the brachial nerves which follow next, Fig. 9. x. φ. But the Trunk which is made out of these shoots goes forward single through the passage of the Neck and the cavity of the Thorax without any branching forth, even to the Diaphragma, Fig. 9. x. where being at last stretched out into three or four shoots, it is inserted on either side to the fleshy or musculous part of it: so that, because the Diaphragma is a Muscle, and performs both its motions, to wit, *Systole* and *Diastole* by its own Fibres, the office of either nerve is only to carry bands or forces of animal Spirits requisite for the indiscontinued action of that part, and also to convey thither the Instincts of the Motions variously to be performed.

As to the first use of this Nerve, viz. for the passage of the animal Spirits, the business is performed in this Muscle, as it is in the Heart. The Spirits flowing into the Diaphragma by the nerves, receive subsidiary Forces, to wit, a sulphureous Copula from the blood, upon whose explosion being still iterated by turns, and the receiving of new, the action of this perpetual moveable depends. Concerning the Instincts of the Motions transmitted by the passage of this double nerve, we may observe, That they are, especially in man, of a double kind: viz. either the action of the Diaphragma merely natural for the performing of Respiration, is continually reciprocated according to the uses of the Heart and Lungs, and altered many ways in their tenour according their needs; or secondly, a certain irregular and unusual motion of the Diaphragma is wont to be excited at the beck of the Appetite, or from the instigations of other parts; for the which, whilst the rest of the Organs of Respiration are compelled to conspire, the act it self of Respiration becomes after a various manner interrupted or unequal.

1. As to the first of these, viz. the unforced motion of this Muscle, it may be observed, That the Diaphragma, with the Muscles of the Thorax and the parts of either, conspire in their motion with the action of the Lungs and Heart: and that between all these such a joynt action may be sustained, it is observed, That three or four branches are sent out from the Vertebral nerves, in the branches of which the nerve of the Diaphragma is rooted, into the intercostal infolding, Fig. 9. φ. and whereas from this infolding the nerves are carried into the Muscles of the Thorax, by this means a communication and consent of action is effected between these and the Diaphragma. Therefore the Diaphragma drawing with it self the Muscles of the Thorax, by reason of other nerves, conspires with the *Precordia*. These in man going from the intercostal nerve, are already described; and in Brutes from the lower infolding of the wandering pair a nerve is sent down into the infolding of the Thorax, to which besides so many shoots and certain fibres reaching forth into the nerve of the Diaphragma, are instead of such a commerce.

2. The Animal and irregular motions of the Diaphragma proceed from various causes and from the divers instigation of other parts, which also in man become much more signal than in brute Animals; because in him the communication is notable by the nerves reaching out from the Cervical infolding of the intercostal pair into the nerve of the Diaphragma; which kind of infolding and nerves are wanting in Brutes.

As to the Species themselves of irregular motions into which the motion of the *Diaphragma* is wont to be perverted, it may be observed, That we are able at our pleasure to stop breathing or respiration for some space, and presently to take it or draw it out. In laughing, weeping, and singing sometimes the *Systole*, sometimes the *Diastole* becomes stronger, and is made frequenter upward or downward with a repeated shaking; which sort of actions of it are made by reason of those near commerces had between the nerve of the *Diaphragma* and other respective parts of the Breast and Face; yea indeed from hence it is effected, (as we have already shewn), that man is peculiarly a laughing Creature. Further, (which we have shewn elsewhere) from the Sympathy which happens between the parts of the Mouth and Face with the *Diaphragma* by those nerves, a good reason of sneezing may be given, and that Problem of *Aristotles* easily solved, to wit, why men alone, or chiefly before other Creatures, sneeze. For the act of sneezing seems to be made for this end, that man may not only clear his Nose, but that all Torpor or heaviness may be shook off for him from the neighbouring Organs of the Senses, yea and from all the fore-part of the Brain: which thing easily succeeds, if the Membranes and nervous passages besmearing the Nostrils and the Sieve-like Bone, like the holes of a Sponge, being strongly wrung forth or squeezed together, be forced to shed forth their moistures; for these parts so emptied, presently like a pressed Sponge, receive other humors, to wit, those coming from the neighbouring parts. In the mean time, that the watry heap so laid up about the caverns of the Nostrils, may be emptied, it ought to be carried away, or wiped out from thence by a vehement blowing of the Air or breath. Wherefore it is observed, That whilst the inward parts of the Nostrils being very sensible, begin to be wrinkled together from some sharp thing pulling or pricking them, and by that means to draw out the watry humor presently by reason of the passage from thence by the branches of the fifth pair into the intercostal Trunk, and from thence by the passage of the nerves which are extended from its Cervical infolding into the nerve of the *Diaphragma*, the consent of the same Action or Convulsion is produced even into the cross bound or Midriff; so that by the same Act as it were with which the Nostrils are wrinkled, the *Diaphragma* also with the *Diastole* being stronger and longer drawn out, is depressed, that the Breast being dilated as much as may be, the Air may be the more copiously inspired. Then as soon as the Spasm or Convulsion of the Membranes, drawn together within the Nostrils and fore-part of the Head, begins to remit, presently the Midriff leaping back with a force, causes the inspired Air to be violently exploded or driven out, which strongly wipes away and carries forth with it the humor pressed out within the caverns of the Nostrils.

We yet ought to inquire concerning the Nerve of the *Diaphragma*, what is the reason, that it always proceeds from the Brachial nerves, and why it doth not rather arise immediately from the spinal Marrow. Truly from hence it seems to follow, that the motion of the Arms in some sort respects the action of the *Diaphragma*; or on the contrary, that this depends on that. Indeed between these two a certain respect or habitude happens; which easily appears by this Argument: The Arms or fore-Legs in all Creatures are made for labour and hard exercise; because by the force of these men fight, and perform the most hard and laborious things, and Brutes run and ascend the most steep places with great pains. But it is very well known, that by too much labour and over-vehement motion of body, the act of Respiration is very much increased, so that the breath almost fails, and is oftentimes in danger to be lost. The reason of this is, because by great exercise the blood is too much forced into the bosom of the Heart, which, lest it should suffocate it, that it might be emptied into the Lungs, very frequent and difficult Respiration is instituted. Therefore from hence may be inferred, That the exercises of the Body ought to be regulated according to the state of the *Præcordia*; or that the motion of the Arms should observe the action of the *Diaphragma*; viz. lest they being stirred by a violent motion, cause the blood to be driven more into the bosoms of the Heart, than the *Diaphragma* instituting a most frequent Respiration, can draw from thence into the Lungs. That this Rule may be perpetually observed of all living Creatures it is so provided, that the nerve of the *Diaphragma*, chiefly conducing to Respiration, should be tyed, as it were a bridle, to the Brachial nerves, which are the principal in the motion of the Body, and so might timely warn these, if unmindful of their duty, and as soon as breath fails, should command them to desist from further moving the Body. Wherefore we observe, when at any time labouring Cattle are urged beyond their strength in labour or motion, oftentimes either some deadly hurt of the heart follows, or else some incurable disease of the *Diaphragma*; for by such immoderate labour, either the Beast languishing quickly dyes, when it is commonly said, that his heart is broke; or else the tone of the *Diaphragma* being wholly broken, Respiration ever after becomes painful and difficult: which is wont to happen ordinarily to Horses, who are driven into too rapid a course with a full Belly.

C H A P. XXIX.

Of the Reason of the difference that happens between the Nerves of the wandering and Intercoastal Pair in Man and brute Beasts; also of the other Pairs of the Nerves arising both within the Skull, and from the Spinal Marrow: also something of the Blood-carrying Vessels which belong to the Spinal Marrow.

THUS far we have described all the Nerves stretching out to the *Præcordia* and *Viscera*, also to most of the other parts, which are the Organs of the involuntary Function, according to the manner by which they are wrought in man; and we have shewn their Offices and Uses, and the Reasons of the most noted appearances in all. Before we proceed to the other Conjugations of the Nerves, it behoves us to shew with what difference the aforesaid Nerves are found in brute Beasts, and for what end such a difference is ordained.

It was already intimated, That the Trunk of the wandering pair in four-footed Beasts doth send forth to the Heart and its Appendix more nervous Vessels than in Man. The reason of which is obvious; because the Cardiac nerves in Brutes proceed almost only from this pair, and scarce at all from the intercoastal; wherefore when they are only of one origination, therefore more are required, all which notwithstanding are much fewer than the same are in Man from a double stock, *viz.* being carried from both the Nerves: forasmuch as Beasts want prudence, and are not much obnoxious to various and divers Passions, therefore there was no need that the Spirits should be derived from the Head into the *Præcordia* by a double passage, *viz.* that one should be required for the exercise of the vital Function, and the other for the reciprocating impressions of the Affections; but that it may suffice, that all those destinated to every one of their offices, may be carried still in the same path.

In most Brutes the intercoastal Nerve goes alone from the Ganglioform infolding of it almost without any branching to its infolding of the *Thorax*: in which passage however it is not always after the same manner in all; for in some it is carried single and apart from the Trunk of the wandering pair, nor doth it communicate with it in its whole journey, unless a little higher by a shoot sent down from the Ganglioform infolding: but in many the intercoastal Nerve passes presently from its Ganglioform infolding into the neighbouring infolding of the wandering pair, *Fig. 10. C.* where, when both nerves seem to close together, from thence both being involved under the same common inclosure, as it were one Trunk, they are carried together till it comes over against the first Rib, and there an infolding being made, the intercoastal nerve, departing from the wandering pair, is carried into the infolding of the *Thorax*; and the other nerve also is stretched between this and that infolding: which nerves, when one is carried under the other above the Artery of the Chancel-bone, making as it were an handle, straiten its Trunk, *Fig. 10. g.*

Although the intercoastal Nerve is carried from the Throat to the top of the *Thorax* under the same sheath with the Trunk of the wandering pair, yet it is not united to it; but they remain distinct still both of them in the whole tract, and the Membrane being dissected, they easily separate one from the other, unless they be knit together by some fibrils sent from one another in some places: but forasmuch as by this means the intercoastal nerve being joyned to the Trunk of the wandering pair, goes under its cover, it seems to be so made only for its safety and better passage: wherefore in some perhaps where the intercoastal Trunk is greater, or the course of its passage shorter, where such a safeguard is not needful, it descends alone. We have seen this Nerve covered with the safeguard of the wandering pair of one side, and in the other to have gone out by it self alone.

Whether the intercoastal Nerve departs from the lower Infolding of the wandering pair or not, however a branch is stretched out between this infolding and that of the *Thorax* in many, perhaps in all brute Beasts, which in its passage binds about the Vertebral Artery, whereby the *Sympraxis* or joynt Action between the *Præcordia* and the exterior Organs of Respiration is sustained: yea from this lower infolding of the wandering pair sometimes we have observed a shoot and fibres to be carried to the beginning of the Brachial branch, in which the nerve of the *Diaphragma* is rooted; also sometimes, though rarely, we may have seen some shoots sent from the infolding of the *Thorax* towards the Heart and its Appendix. In a Monkey above this infolding of the *Thorax*, as we have intimated before, were some shoots and small branches reaching from the intercoastal nerve towards the *Præcordia*.

We may take notice concerning those Nerves below the *Præcordia*, distributed every where into the Ventricle and the lower *Viscera*, that there is scarce any difference of them in Man and Beasts. The nerve of the *Diaphragma* is placed lower in four-footed beasts: the reason of which is, because the Brachial nerves, out of which that ought to proceed, arise lower: to wit, because Brutes have longer necks, as if destinated to the yoke. These things being thus premised concerning the difference of the Nerves in either Species, it remains that we pass on to the unfolding the remaining pairs of them.

Therefore of those arising within the Skull, the ninth pair is made up of many Fibres also in its beginning, (as was shewed before) out of which being gathered together, one Trunk being made is carried towards the Tongue, through whose whole substance, to wit, from the bottom to the top, having passed, it disperses in its whole passage small shoots on either side, *Fig. 9. G.* So that nothing is more obvious than that this nerve performs the motions of the Tongue requisite for the articulation of Sounds, as the nerves of the fifth pair spread into this member, serve for the distinguishing of Tastes; for the exercise of either Faculty, *viz.* both motive and sensitive, the texture of Tongue being notably fibrous, hath the virtue of a double Organ; therefore by the two nerves, besides the supplements of Spirits, are carried both the Instincts of the Motion and the sensible Impressions.

That the aforesaid Nerves of the ninth pair may more easily perform the motions of the Tongue, it sends forth downward one shoot before the entrance of the Tongue, which is united with a shoot from the tenth pair meeting it destinated to the *Sternothyroidal* Muscles; and the other little branch of the ninth Conjugation is distributed into the Muscles of the Bone *Hyoides*, *Fig. 9. G. G.* In truth these shoots being sent down as so many little ropes, conduce to the moving of the Muscles, which are fixed to the bottom of the Tongue, which Muscles being placed as so many Props to the Tongue, do facilitate its motion.

The Nerve of the tenth pair, although it may seem to arise within the Skull with many little Fibres also, yet being sent down from thence into the bony Cloisters of the Spine, not arising but within the first and second *Vertebra*, it is carried without. Presently after its entrance it sends forth two nerves into the infolding of the intercostal nerve; for what end hath been already shewn: But its chief Trunk spreading downwards, and receiving a shoot produced from the ninth pair, is bestowed on the *Sternothyroidal* Muscle. Moreover, this nerve reflects branches outwards, which are distributed into the Muscles of the Neck reaching out towards the hinder part of the Head; so this pair, as if it were only of the number or rank of the Vertebral nerves, imparts some branches to the intercostal nerve, and all the other shoots and branches of it serve for the performing of the motions of the Muscles of the Neck, *Fig. 9. H. * . □ . Δ.*

So much for the Nerves arising within the Skull, which (as was shewn) having their being from the parts of the Brain or Cerebel, are destinated to the offices of the spontaneous or the involuntary Function, and are chiefly distributed into the Organs of the Senses or the *Viscera* of the vital and natural Faculty. There remain many other Conjugations of Nerves, the roots or beginnings of which consist in the spinal Marrow, which is only the exterior production of the oblong Marrow. These spinal Nerves, besides some branches that they bestow on the intercostal pair, are employed almost wholly on the muscular stock, and the office of them is to carry outwardly the forces of the Spirits and the Instincts of the Motions to be performed, and to convey inwardly the impressions of sensible things. Forasmuch as the spinal Marrow seems to be derived from the Brain, and is as it were a broad and high road produced or leading from the same, without any paths or tracts inserted to it from the Cerebel, therefore the animal Spirits flowing within its nerves, do almost wholly execute the Acts of the spontaneous Function.

To describe all the several pairs of the spinal Nerves, and to rehearse all their branchings, and to unfold the uses and actions of them, would be a work of an immense labour and trouble; and as this *Neurologie* cannot be learned nor understood without an exact knowledge of the Muscles, we may justly here forbear entering upon its particular institution: but it may suffice concerning these nerves and their medullary beginning, that we advertise only in general what things may occur most notable and chiefly worth taking notice of.

As to the Nerves therefore produced out of the spinal Marrow, it may be observed, That in both sides of it, nigh the outward margin or brim, four or five Fibres arise in the superior brim, and as many in the inferior: either maniple or handful pass through with distinct Fibres the *Pia Mater*, or the lowest Coat spinal Marrow, which is as it were the common sheath of them all; but afterwards the Fibres passing through the third Membrane of either margin, (for three cloath the spinal Marrow) they joyn together, and having cloathed themselves with a Coat gotten from the second Membrane, they become as it were one Trunk; which Trunk going out at the space between the knot of the *Vertebra*, is again divided into many nerves destinated to several parts. After this manner in the whole tract of the spinal Marrow, the Vertebral nerves have their birth; but in those places where the *Brachial* and the *Cranial* nerves go out, both the thickness and the breadth of the spinal Marrow are increased, and also the handfuls or bands of the Fibres are larger. All these are well represented in *Fig. 12.*

The Brachial Nerves are not only far greater than the Vertebrals, so that they appear as it were large and broad nervous chords; but that they may conspire together, and serve for the strong motions of the Arms, or the fore-Legs of Beasts, it is observed, That very many of them are knit together by the cross nervous Processes. These Processes in four-footed Beasts (the fore-Legs of whom are destinated for un-

wearable pains and difficult labour) are produced cross-ways after a curious manner, as may be discerned, *Fig. 10. l.l.* The use of these seems to sustain not only the consent of action in many nerves together, but also their mutual strength; that some bands of Spirits might awaken or stir up others, and for the exercising strongly the locomotive force, they might mutually support and relieve one another. And not much unlike this, the business is about the Crural Nerves, where nervous cords signally large, being produced from the Juncures of the *Vertebrae*, whilst they descend towards the Thigh, they which are above receive in their whole tract the nervous Processes which are sent out still from those below, *Fig. 11. p.p.p.*

We may yet take notice farther concerning the spinal Marrow, that as it sends out Nerves by bands, and as it were by troops, in an orderly series and military order; so its sanguiferous Vessels are disposed with no less signal artifice. For those which are carried in the superficies of the spinal Marrow, and the Arteries, Veins, and other Sanguiducts, which are nigh its compass, do contain some things more rare and highly worth the noting.

In the first place we may observe, That the blood-carrying Vessels do cloath the whole substance or frame of the spinal Marrow, as well as the oblong Marrow with a thick series of shoots, which may be made more manifest to any one, if first of all Ink were injected into the Vertebral Artery; for from such an injection often repeated, it will easily appear, that the infoldings of the Vessels do cover as it were in the shape of a Net, the upper tract of the Marrow. But by what means these Vessels proceed on both sides from the Trunk of the Vertebral Artery, and also the blood-carrying Veins, which are destinated to the whole spinal Marrow, and the inferior portion of its arterious passages, doth not so plainly appear; because the bony Cloisters of the *Vertebrae* are not broken through without much labour, especially in grown up living Creatures; and in that work the beginnings and branchings out of very many Vessels are wont to be blotted out: But that we might more accurately search into these hid things, we made the dissections of several *Embryons*, in which we were able to dissect more narrowly into all the recesses of the Bones: further, that all the tracts and branchings out of them might be the better perceived in all the Vessels, we did cast in divers coloured Liquors. And we had our desired wish: for presently we found with much admiration, that those kind of Vessels, *viz.* Arteries, Bosoms, and Veins, which respect the Head, belong also to the spinal Marrow with no less a noted disposition of provision.

When we did dissect the Heads apart from the Spine, we did think, according to the Opinion of the Vulgar, that the Vertebral Arteries did belong only to the Head; and when there did appear in the cut off Trunk of the oblong Marrow three arterious branches (as they are described above in the first and second Table) therefore in the Explication of either Figure we have affirmed the Vertebral Artery to be carried with a triple branch into the hinder part of the Head. But the Vertebral Artery pays to the superior part of the Spine as great Tributes of Blood as to the Head it self; and that middle arterious branch, which is marked in the first Figure with the Letter T, in the second with S, doth not ascend into the Head, but descends from that conourse of Vertebral Arteries towards the Spine, and conveys downwards from the common flowing together of the blood there made by many Arteries, the *Latex* for the watring top of the spinal Marrow. Wherefore in this place it seems convenient, that we do not only correct that error of ours, but that we deliver an exact description of all Vessels which are destinated to the Spine, *viz.* which contain many wonderful things. As therefore these Vessels are of a threefold kind, *viz.* Arteries, Bosoms, and Veins, we will expose each of them particularly; and first concerning the Arteries we say.

The Arteries which carry the Blood towards the Spine, are disposed after one manner above the Heart, and after another below it. As to the first, whereas the Trunk of the *Aorta* being there cleft presently into many branches, departs from the Region of the Spine, therefore the Vertebral Artery is produced on both sides from its axillary branches, which ascending straight into the hinder part of the Head, sends forth a branch into the meeting together of every *Vertebra*: But below the Heart, forasmuch as the *Aorta*, in its whole descent, lyeth on the Spine, two Arteries are received into the Spine from its bottom nigh its *Internodia* or spaces between the knots of the *Vertebrae*; so that if the Trunk of the *Aorta* be cut open long-ways, there will appear a series of double holes through its whole tract, after a most curious manner, as in the head of a Lamprey.

The arterious Branches which are carried both above and below the Heart towards the Spine, becoming presently forked, bestow one shoot on the neighbouring Muscles, and another they insert into the Juncures of the *Vertebrae*; which being carried within the bony den, is cleft presently into three branches, two of which are bestowed on the medullar Trunk, and the other on the Membrane compassing about the bony den before, *Tab. 13. Fig. 3. a.b.c.d.e.*

As to the shoots destinated to the medullar Trunk, they presently tending two ways, and meeting with either maniple or band of nervous Fibres, ascend towards their beginnings; and so one little Artery having got to the superficies of the hinder Marrow, distributes into it hairy Vessels: but the other arterious shoot, which is the greater and chiefest, as soon as it attains the margin of the former Marrow, is carried from thence by an oblique passage into the middle fissure or cleft of it, where meeting with a shoot of the pair of the other side, it is united to the same, and from that joyning together the arterious Trunk, as it were a common passage, and made up of either Vertebral shoot, descends into that cleft by the open space of one of the *Vertebrae*, and in that short passage both dispenses little Arteries on either side,

side, and also inserts them leaning on the *Pia Mater* more deeply betwixt the sides of the Marrow: and so whereas in the whole tract of the Marrow, the chief Trunk of every Artery is carried into the middle cleft, it seems at first sight, as if the same arterious Trunk were carried under the whole substance of the Marrow from the head to the tail, *Tab. 13. Fig. 1.* Further, as by a concurrence of several shoots of either side, the spinal Artery descends above the cleft of the Marrow, so where the Trunks of the Vertebral Arteries joyn together (which happens to be done sometime in the hinder part of the Head above the oblong Marrow, and often in the Neck above the spinal) an arterious branch somewhat bigger than the rest is stretched out downwards. This formerly (as we mentioned but now) we mistook for the third ascending branch of the Vertebral Artery. But I have often taken notice, that in Brutes, where the Vertebral Arteries have met together with an acute Angle above the medullar Trunk, they are presently, departing one from another, stretched out directly to either brim of the Marrow, from whence immediately being bent back, they are carried again into a mutual meeting, so that between their two joinings together is made the figure *Rhomboides*, as it is in *Tab. 13. Fig. 1. C.* The reason of which without doubt is this; to wit, that the more rapid course of the blood going towards the Head might be hindered by its flood being a little space divided.

The third Brancy of either Vertebral Artery being carried into the anterior Cavity of the bony Den, and being presently made forked, tends to the right and left, and is on both sides inoculated to the next shoot of the same side and by the cross process, they of either side are united after the same manner; and so all the Arteries of this cense or rank receive one another mutually, as it were links of a chain, in the whole tract of the Spine, and are continued in the same bending passage. If Ink be cast into the Trunk of the Vertebral Artery and most of the hollowneses of the *Aorta*, all these Arteries dyed with the same, will appear a pleasant spectacle, like Net-work, as may be seen *Tab. 13. Fig. 3.*

The top of this arterious Infolding being carried into the Skull, inserts two shoots sent forth straight into the wonderful Net, and imparts two others going out side-ways on both sides to the *Dura Mater*: the lower end of the same reaching to the *Os Sacrum*, ends in very small Vessels which serve for the Membrane of the Bone.

If it should be asked, For what end these Arteries being concatenated with such frequent ingraftings are disposed within the Back-bone: This seems to be so ordained for three uses: *viz.* First, These Vessels (as also the passages of the Bosoms) are divaricated after this manner with repeated compassing about, that a constant heat from the blood being so turned about, as it were into frequent Whirlpools, might be supplied about the compass of the spinal Marrow, as it were by a *Balneum Mariae*; even such a manner of office as the *Choroecidal* infolding performs within the infolding of the Brain. Secondly, Care is taken by this means, lest the blood destinated for the spinal Marrow, might flow thither too plentifully, or might be defective in its due influx; for the blood being about to flow into the medullar stock plentifully, is diverted from the little branches *c.d.* into these Emissaries *e.f.* and in its defect the subsidiary provision being called out of the middle infolding through the chanel *e.* into the Vessels *c.d.* is derived into the same medullar Trunk. Thirdly, The use of this arterious infolding seems to be, that the blood may be distributed from its passages into the Membranes, *viz.* which is carried every where from them through the Capillary Vessels; the reliques of which also are supped back by the little chanels sent out of the bosoms. Further, from this Store-house, if necessity urges, a certain provision is had for the wants of the Brain; wherefore from hence the small Vessels end in the wonderful Net.

So much for the Arteries distributed about the Spine or Back-bone; the Vessels of the second sort are the Bosoms, which come between the Arteries and the Veins for the use of the spinal Marrow no less than of the Head it self, and are here ordained with a more curious implication. But the reason why bosoms are required to these more noble parts, and scarce to any in the whole Body besides, is this, to wit, that about these bodies all manner of extravasation, or any stagnation of the blood, might be hindered: but sometimes the Veins are not sufficiently emptied, that they may presently receive from the Arteries the deposited blood, and so may prohibit any flowing out of it; wherefore the bosoms, as more fit receivers, are destinated to that office, for that their receptacles are larger and soon emptied; and for that reason they may more conveniently derive the blood from either medullar substance, lest it should overflow it in the Head or Spine.

As to the Figure of the Vertebral Bosom, its passages being conform to the arterious infolding, are put under it in the whole tract of the Spine: for after a like manner, in either bosom, which is extended within the cavity of the bony Den, from the hinder pair of the Head to the *Os Sacrum*, there is one receiving Vessel, by whose twofold chanels presently the blood is brought back from either superficies of the Marrow into the bosom, and another carrying back, by whose passage the same is exported into the Veins. Moreover, in many Animals (though not in all) the bosoms on either side seem to be knit together upon the knots between the Vertebra by the cross processes, and so communicate between themselves: either bosom in its top is continued into the lateral bosoms of the Head; further, from it on both sides a passage lyes open into the Jugular Vein and into the Vertebral, *Tab. 13. Fig. 4.*

What the use of the aforesaid Bosom is in general was but now intimated; to wit, that the blood deposited from the Arteries in the spinal Marrow, might be presently emptied from thence, and be retained within the more large Cavities of the Bosoms, till it may be transferred into the Veins being made more emptied: But the reason of the divers sorts of implications, and the frequent ingraftings which is found about

about their little chanel, seems to be, that the blood, if by chance it being plentifully heaped up within some part of the bosom, should there stagnate, or be apt to regurgitate into the Marrow, it might be drawn out by those frequent Emissaries here or there into the middle or opposite side: after a like manner it is with the bosoms about the Spine, as when a Country-man digs his ground frequent crosse Furrows for the draining away any superfluous moisture.

There remains another use of the Vertebral Bosoms, of which we made mention before, to wit, that the blood nigh the medullar Body, being brought through their variously intorted Meanders, (like the arterious infoldings) might yield heat requisite for the swift passage of the animal Spirits, as it were a *Balneum Marie*. That the bending tracts and complications of the Bosoms may be the better seen, a certain tincture may be cast into the Vertebral Veins; and presently that invading the passages of the bosoms and marking them, will exhibit the appearance of a long Ladder with many little labels hanging to it.

Yea at length by those little roundles we are led to the third kind of Spinal Vessels, which are the Veins, into which all the bosoms immediately convey their burden, whereby they being continually emptied, may be still able to receive fresh blood: wherefore the venous branch is stretched out by the several joynings of the *Vertebrae* into the bosom, which presently carries away the blood laid up in it, and to be reduced towards the Heart. The Veins designed to this office, after the example of the Arteries, are disposed after one manner above the Heart, and after another below it. As to the first, a branch going from the Trunk of the *Vena Cava* below the Chanel-bone, or the first little Rib of the Breast, accompanies the Vertebral Artery, and ascending by the holes of the Processes between the several *Vertebrae*, inserts a little branch to the Bosom, *Tab. 13. Fig. 2. b.b.b.* Then the top of this Vein being carried towards the hinder part of the Head, is continued into the Trunk of the Bosom, and opened by the other passage into the Jugular Vein. But further, as if these communications were not yet sufficient for the draining away the blood, transverse branches also are stretched out between both Veins, *Tab. 13. Fig. 2. i.i.i.* So manifold diverting places appear, by which it is enough and more than enough provided, lest the blood might flow back towards the medullar Trunk upon any occasion. Below the Heart, because the Trunk of the *Vena Cava* cannot, as the *Aorta*, immediately lean upon the Spine, and carry shoots straight to the same, therefore it sends forth a Vein without a Companion, out of whose Trunk forked or twofold branches being sent forth, go forwards both to the Muscles of both sides and to the Spine it self. Below the Kidneys, seeing there is a space granted for the *Vena Cava* to be carried nigh the Spine, the *Azygos* Vein ends, and from the Trunk of the greater Vein, as from that of the Artery, the Vessels belonging to the Loyns immediately proceed.

These things being lately observed concerning the blood-carrying Vessels belonging to the Spine and the hinder part of the Head, and here inserted in the place of an Appendix, ought to be referred to the other Doctrine of this kind, delivered above in the eighth Chapter. In the mean time, that we may return to our purpose, to wit, what remains of *Neurologie*, there is not much more to be met with worthy note concerning the Nerves: For they, as to the greater and chief Ramifications, are almost constantly both in Man and brute Beasts, after the manner we have described them. Sometime it happens, although very rarely, concerning the divarications of the smallest Shoots and Fibres, that there is some variety: but as to the primary Vessels, and those drawn from them, the Configuration of every pair of Nerves is still the same or alike in all. It now remains, that the Theory of the Nerves, hitherto drawn in words, and so only objected to the Understanding, may also be shewn to the Sense, which will make it clearer. Wherefore we have taken care, that the ingraven Delineations of the wandering and intercostal pair of Nerves, and also of others which are of chief note, and of the Spinal Marrow it self be plainly exhibited. The Figures of these, although taken from a dead Example, yet after many Dissections and a frequent comparing them together according to their several parts, they are described as if from the life; the Lineaments of which with *Characteristical* Notes, that they may be the better and more distinctly perceived, and a large draught of every Figure, equal almost to the Scheme of Nerves in their animated Body, we have caused to be cut: further, because the Contents of either side and of the Cavity between, cannot be at once described in their proper situation; therefore here it is supposed, That the *Spine*, with the oblong Marrow, or the whole medullar Stock, cut in the midst is rolled out, and both sides of it, with the pairs of the Nerves arising in the whole Tract, is turned outward.

The Ninth Table.

Shews the beginnings of the fifth and sixth pair of Nerves, and the Roots of the Intercostal Nerve proceeding from them; moreover, the Origines and Branchings out of the same Intercostal Nerve and the wandering Pair, and of the accessory Nerve produced out of the Spine to the wandering Pair carried to the Region of the Ventricle. Besides, here are represented the beginnings and distributions of the seventh, ninth, tenth Pair of Nerves, and of the Nerve of the Diaphragma; also the beginnings of the Vertebral Nerves in their whole Tract from the Region of the Nerves inserted in the *Præcordia* and *Viscera* are described, and their Communications with the former. All this whole following Table shews how it is found in Man different from other living Creatures.

- A. The Nerve of the fifth Pair with its two Branches A. A. the upper of which tending straight forwards, distributes shoots into the muscles of the Eyes and Face, into the Nose, Palate, and the upper part of the whole Mouth; moreover, it reflects two shoots a. a. which are the two roots of the intercostal Nerve: the other lower Branches of the fifth Pair tending downwards, is dispersed into the lower Jaw and all its parts.
- a. a. Two shoots sent down from the upper Branch of the fifth Pair, which meeting together with the other shoot b. reflected from the Nerve of the sixth pair, constitute the Trunk of the Intercostal Trunk D.
- B. The Nerve of the sixth pair tending straight forwards into the muscles of the Eyes, out of whose Trunk a shoot b. which is the third root of the intercostal Nerve, is reflected.
- b. The third root of the intercostal Nerve.
- C. The Original of the hearing Nerves or of the seventh pair with its double Process, viz. soft and hard.
- c. The softer Branch of it which is wholly distributed into the inward part of the Ear, viz. into the muscle lifting up the hammer, and into the shell.
- c. The harder Branch of it, which arising whole without the Skull, and being inoculated with the shoot of the eighth pair e. constitutes with it a single Nerve, which presently is divided into many shoots: of which,
 - 1. is bestowed on the muscles of the tongue and of the bone Hyoides;
 - 2. Again into more shoots, the upper of which
 - 3. Into the muscles of the Face and Mouth.
 - 4. Into the muscles of the Eye-lids and Forehead.
 - 5. Into the muscles of the Ear.
- D. The trunk of the intercostal Nerve consisting of the three aforesaid Roots about to pass into the Ganglioform infolding: which infolding of the intercostal Nerve, brought without the Skull, seems to be the highest knot.
- E. The Original of the Nerve of the wandering or eighth pair consisting of many Fibres, with which the Nerve F. arising out of the Spine, joins, and being inoculated with them, passes together through the Skull, which being passed, it departs again, and having made a communication with some neighbouring Nerves, is bestowed on the muscles of the Shoulders and Back.
- e. A shoot of the eighth Pair meeting with the auditory Nerve.
- f. f. f. Other shoots of the wandering Pair going into the muscles of the Neck.
- G. The principal Branch of the same Pair being lost or drowned in the Ganglioform infolding being near.
- H. The upper Ganglioform infolding of the wandering Pair which admits a shoot k. out of another near infolding of the intercostal Nerve.
- h. A branch out of the aforesaid infolding of the wandering Pair going into the muscles of the Larynx, a noted shoot of which entering into the Shield-like Cartilage, meets with the returning Nerve, and is united to the same.
- i. A shoot sent from the cervical Infolding of the intercostal Nerve into the Trunk of the wandering Pair.
- K. The lower infolding of the wandering Pair from which many Nerves proceed for the Heart and its Appendix.
 - l. A noted shoot sent to the Cardiac infolding.
 - m. Nervous Fibres distributed into the Pericardium and the Vessels hanging to the Heart.
 - n. The left returning Nerve which being reflected from compassing about the descending Trunk of the Aorta upwards towards the Scutiform Cartilage, imparts in its ascent many shoots **** to the rough Artery, and at length meets with a shoot h. sent from the Ganglioform infolding. This returning back from the knot of reflection, sends some shoots towards the Heart.

- L. The returning Nerve in the right side, which being reflected much higher, binds about the axillary Artery.
- O. A noted branch sent down from the Trunk of the wandering pair in the left side towards the Heart, one shoot of which presently becoming forked, compasses about the Trunk of the Pneumonick Vein; the other attaining the hinder region of the Heart, is dispersed into many shoots which cover over its superficies: a like Cardiac branch sent out of the Trunk of the other side, meet with this.
- p. The shoot of the aforesaid branch going about the Pneumonick Vein.
- q. Another branch of the same imparting to the Heart many shoots which cover over its hinder superficies, turned back beyond their proper situation.
- r.r.r. Small shoots sent out of the Trunk of the wandering pair which are inserted by a long tract to the Oesophagus.
- S.S.S. Many shoots cut off, the branchings of which being distributed into the substance of the Lungs, variously straiten and bind about the blood-carrying Vessels.
- T.T.T. The Trunk of the wandering pair divided into two branches, viz. the exterior and the interior, either of which inclining towards the like branches on the other side, are united to the same, and after a mutual communication constitute the two Stomachical branches, viz. the upper and the lower.
- V.V. The inward branches, which being united in X, constitute the beginning of the lower Stomachical branch.
- W.W. The outward branches, which being united in the Figure to be added to this, make the upper Stomachical branch.
- X. The joining together of the inward branches.
- F. The beginning of the Nerve of the ninth pair with many fibres, out of which being united, a Trunk being made is carried towards the tongue; but in its progress sends out two shoots.
- o.o. The first shoot tending downward, and united to a branch of the tenth pair, is bestowed on the Sternothyroidal Muscle.
- o.o. The second shoot on the Muscles of the Bone Hyoides.
- o. The Trunk of this Nerve passing into the body of the tongue.
- G. The upper Ganglioform infolding of the intercostal Nerve, which is the highest knot of this Nerve, being come out of the Skull.
- α. A shoot out of this infolding sent into the neighbouring infolding of the wandering pair.
- b.b. Two nervous Processes by which this infolding communicates with the Nerve of the tenth pair.
- γ. A shoot sent down into the Sphincter of the throat.
- Γ. The middle or Cervical infolding, which being proper to man, is placed nigh the middle of the neck in the Trunk of the intercostal Nerve.
- δ. A noted branch out of the second Vertebral pair going into this infolding, whereby this communicates with the Nerve of the Diaphragma in its first root.
- ε.ε. Two branches from the same infolding into the Trunk of the Nerve of the Diaphragma.
- ξ.ξ. Many nervous fibres coming from the Cervical infolding into the returning Nerve and into the Blood-carrying Vessels, and are also sowed into the Trunks of the Trachea and the Oesophagus.
- θ. A shoot from the same into the Trunk of the wandering pair.
- χ. Another signal shoot into the returning Nerve.
- η.η. Two signal shoots sent down towards the Heart, which another branch λ. follows, arising a little lower: these being carried downwards between the Aorta and the Pneumonick Artery, meeting with the like branches of the other side, constitute the Cardiac infolding, Δ. out of which the chief Nerves proceed which are bestowed on the Heart.
- λ. A branch proceeding a little lower from the intercostal Trunk, which is destinated with the former to the Cardiac infolding.
- Δ. The aforesaid Cardiac infolding.
- μ. The handle going from the same, which binds about the Pneumonick Artery.
- ν. The lower handle binding the pneumonick Vein.
- Ξ. The intercostal Nerve demersed into the cavity of the Thorax, where it binds the axillary Artery.
- ξ.ξ.ξ.ξ. The four Vertebral Nerves sent down into the infolding of the Thorax, the upper of which binds the Vertebral Artery.
- ο.ο.ο. Three noted branches sent down from the Cardiac infolding, which cover the anterior region of the Heart, as the Nerves p. q. going from the Trunk of the wandering pair, impart branchings to its hinder part.
- π. The Vertebral Artery bound about by the Vertebral Nerve.
- ς.ς.ς. Nervous shoots covering the anterior region of the Heart.
- τ.τ.τ. Shoots and nervous Fibres distributed to its hinder part.
- ο. The lower Infolding, called properly the Intercostal or Thoracical, into which, besides the intercostal Nerve, four Vertebrae are inserted: the uppermost of these in its descent binds about the Vertebral Artery.
- Ι. The intercostal Nerve descending nigh the roots of the sides through the cavity of the Thorax, where in its whole progress it admits a branch from between the several knots of the Vertebrae.

- H. The Nerve of the tenth pair, consisting of many fibres in the beginning, arises between the first and second Vertebrae, where presently it sends forth two nervous processes b. b. into the upper infolding of the intercostal Nerve.
- * A branch of it, which being united to a shoot of the ninth pair, is bestowed into the Sternothyroideal Muscle immediately lying on the rough Artery.
- . A shoot reflected into the posterior muscles of the Neck.
- Δ. A shoot into the parietick Spinal Nerve.
- ♦ ♦ ♦ Shoots from the chief branch of the same Nerve into the Sternothyroideal Muscle.
- L. The original of the chief Vertebral Nerve, which in this, as in all other Vertebrals, consists of many Fibres, one band of which going out of the lower margine of the Spinal Marrow, and another from the upper, meeting, go together into one Trunk, which is presently divided into nerves distributed many ways.
- g. A shoot from this Nerve into the branch of the tenth pair.
- g. Another shoot into the Spinal Parietick.
- c. A noted shoot sent forth upwards into the muscles of the Neck and Ears.
- T. A shoot from the crooked Nerve into the muscles of the Neck.
- g. A Nerve from this pair into the first brachial nerve, out of which the nerve of the Diaphragma hath its highest root.
- M. The beginning of the second Vertebral, out of which the upper Brachial branch proceeds, and in which the nerve of the Diaphragma is first rooted. This Brachial nerve in four-footed Beasts arises near the fourth or fifth Vertebrae, and so the root of the Diaphragma is placed lower.
- v. The Vertebral branch destinated to the Arm.
- x. The Nerve of the Diaphragma, a shoot of whose root s. comes to the Cervical infolding, and a little lower two other branches from the same infolding &c. are reached out into its Trunk. This communication is proper to man.
- Q. The other root of the Diaphragma from the second and third Brachial nerve.
- x. The lower Trunk of the nerve of the Diaphragma being removed out of its place, which in its proper situation, passing through the cavity of the Thorax without any communication, goes straight forward to the Diaphragma, where being stretched out into three shoots, it is inserted into its musculous part.
- l.l.l.l. The other Brachial nerves, out of whose roots nerves go into the intercostal Infolding.
- l.l.l.l. The beginnings of the Vertebral nerves, from the several roots of which a branch is carried into the intercostal nerve.
- u. u. The last beginning of the Spinal accessory Nerve, going to the wandering pair, beginning with a sharp point.
- g. The trunk of the same Nerve ascending, which in its whole ascent, going through the side of the Spinal Marrow, passes through the midst of the beginnings of the Vertebral nerves, and receives Fibres from the stock of the Marrow.
- g. The trunk of the same Nerve descending, which departing from the wandering pair, is reflected outwards, and after having had communications with the nerves of the ninth and tenth pairs it is bestowed wholly on the muscles of the Shoulder.
- d. The lower process of the same Nerve.

The Tenth Table.

Shews the beginnings and Branchings out of the same Nerves which were described in the former Table, as some of them are found in brute Beasts otherwise than in Man.

- A. The trunk of the intercostal Nerve going out of the Skull.
- B. The upper Ganglioform infolding springing out of the trunk of the intercostal nerve.
- C. The intercostal nerve arising out of the aforesaid proper infolding, and sent down into the other neighbouring infolding of the wandering pair.
- D. A shoot from the upper infolding into the Sphincter of the throat.
- E. Both the Nerves included in the same sheath, as if they were the same trunk, descend towards the Thorax: out of which trunk appearing in this place, a branch is sent out into the returning Nerve.
- F. The lower infolding in the trunk of the wandering pair, or rather consisting in the common sheath of either nerve.
- f. A shoot out of this infolding into the Brachial branch coming between, in which branch the nerve of the Diaphragma hath its root.
- G. The intercostal Nerve departing from the same infoldings, and going under the axillary Artery, is inserted into the infolding of the Thorax.
- g. Another Branch going between the two infoldings, and going above the axillary Artery, so that these two nerves having made an handle, bind about the Artery.
- H. A noted shoot out of the aforesaid infolding of the wandering pair into the Cardiac infolding.
- i.i.i.i. From thence many nervous Fibres are sent down into the Vessels belonging to the Heart, and into the Pericardium.
- k.k.k.k. The greater Brachial nerves which are produced a little lower in Brute animals, than in Man: and therefore the nerve of the Diaphragma arises lower.
- L.L.L. The Brachial nerves mutually cutting one another by the cross processes, communicate among themselves.
- M. The Nerve of the Diaphragma consisting of three roots, when in Man they are only two.
 - 1. The first root of the same Nerve.
 - 2. Its second Root.
 - 3. Its third Root, which communicates mediately with the infolding of the wandering pair, viz. by the trunk of the Brachial branch, to which it is fixed.
- n. A Nerve carried from the second Brachial branch into the intercostal infolding, which binds about in its passage the Vertebral Artery.
- N. Shoots and suckers sent down from both knots of the returning nerve towards the Heart and its Appendix.

The other Nerves and their Branchings out are as in the other Figure, which shews the pattern of them in Man.

The Eleventh Table.

Shews the lower Branchings out of the wandering and the Intercostal Pair, distributed to the Ventricle and the Viscera of the Abdomen; also the beginning of the Vertebral Nerves, which are placed over against the former, and are ingrafted into some of them. The Figure of these in Man and in four-footed Beasts is almost alike, so that this Table may be common for both.

- A. The lower Stomachical Branch which is made up out of the internal branches of each wandering pair, being united together, and covering the bottom of the Ventricle, disperses shoots on every side in the whole tract.
- B. The upper Stomachical Branch which is made out of the external branches of the wandering pair, on either side united together, and creeps through the top of the Ventricle.
- C. The Coalition or joyning together of the Branches.
- D. The nervous Infolding out of the Fibres of both the Stomachical nerves, being united together nigh the Orifice, and as it were woven into a Net.
- a.a. The ends of both the Stomachical nerves which there meet with the nerves of the Liver, and communicate with them
- E.E. The Intercostal nerve descending on either side nigh the roots of the Ribs, and in its whole descent receiving a branch from the several Vertebral nerves &c.
- F. A branch going out of the Nerve of the left intercostal side, and sent down towards the Mesenterick infoldings.
- G. The same Mesenterick nerve becoming forked, sends out the greater branch into the infolding, which is the Stomachical and Splenetic, and the lesser into that belonging to the Reins.
- H. The like Mesenterick branch going out of the intercostal nerve on the right side, and inclining towards the Mesenterick infolding.
- I. The greater Branch of this nerve becoming in like manner twofold, the greater branch going into the Hepatick and the lesser into the Renal infolding, or that belonging to the Kidney.
- h. The chief Mesenterick Infolding of the left side, which is also the Stomachical and Lienary, or belonging to the Spleen; out of which many little bundles of Nerves or numerous Conjugations are sent out many ways.
- u. The Renal Mesenterick Infolding of the left side, into which, besides the Mesenterick shoot,
- β.β. Two other Nerves are carried immediately out of the intercostal nerve.
- γ.γ.γ. From this Infolding, planted near the Biliary Chest, many Nerves and Fibres are sent into the Kidney.
- Δ.Δ. Nerves and Fibres by which this infolding communicates with the greatest infolding of the Mesentery.
- ζ. The chief bundle of Nerves tending out of the former infolding h. into the Spleen, which it having reached, reflects from thence certain Fibres into the bottom of the Ventricle.
- η. The second Conjugation of the Nerves from the aforesaid infolding into the bottom of the Belly, whose Fibres communicate with the shoots and fibres of the lower Stomachical nerve.
- θ. The third Conjugation of Nerves between this infolding and the neighbouring Hepatick δ.
- ι. The fourth Conjugation of the Nerves between this and the greatest infolding of the Mesenterick ϑ.
- κ. The Renal Mesenterick Infolding of the right side, into which (as in its fellow) besides the Mesenterick branch.
- K.K. two nerves are produced from the intercostal nerve.
- λ. The Nerves and Fibres between this infolding and the greatest of the Mesenterick.
- μ. A noted Branch between this infolding and the neighbouring Hepatick.
- ν. A noted Company of Nerves and Fibres from this infolding into the Kidney, which climb over the emulgent Vessels, and variously bind them about.
- δ. The superior Mesenterick Infolding of the right side.
- α. A great Conjugation of Nerves out of this Infolding into the Liver and Gall-Chest, out of which also many shoots are distributed into the Pylorus and Pancreas. The Nerves and Fibres of this, in its ascent towards the Liver, cover the Hepatick Artery, by making as it were a little Net, and almost hide its Trunk. The shoots of these meet with the tops of the Stomachical nerve α.α.
- τ.τ. Shoots distributed about the Pylorus.
- ρ.ρ. Other shoots dispersed into the Pancreas.
- σ.σ. Nerves reaching out between this Infolding and the greatest of the Mesentery. This infolding communicates with the neighbouring Renal by μ. and with the Stomachical by θ.
- ϑ. The greatest Mesenterick infolding out of which a mighty bundle of Nerves arising under the great Glandula of the Mesenterick from thence is dispersed on every side about into many shoots and branches, and they are distributed into all the Intestines, except the straight Intestine. The Nerves and Fibres reaching

reaching out on every side, are knit to the Mesenterick Arteries and Veins in its whole compass, and variously strain and bind them about.

- T.T. Nervous shoots from this Infolding into the Womens testicles, or the uterine Glandula's, which meet with the branches of the Vertebral nerves of the twentieth and one and twentieth pair sent into the same parts, and are inoculated with them.
- V.V. The Vertebral branches into the Womens testicles.
- Y. The lowest Infolding of the Mesentery placed much below the former, and having for its beginning three nerves on either side arising lower from the Intercostrals.
- Q.Q.Q. Three Nerves on either side sent down from the intercostal nerve into the lowest infolding of the Mesentery.
- X.X. A Nerve stretched out of that Infolding directly into the greatest infolding of the Mesentery, which in its passage receives on both sides some shoots from the intercostal nerve, viz. 4.4. 5. 5. and it self sends two shoots into the Women testicles.
- J.J. Two branches from the aforesaid Nerve into the Women testicles.
- Z. Another small Infolding standing a little above this lowest.
- a. A nervous Process reaching out of the aforesaid lowest Infolding into the neighbouring very little infolding.
- a. From the least Infolding Z. a noted nerve being carried into the greatest infolding of the Mesentery, which in its whole ascent stretches under the straight Intestine and part of the Colon, and inserts frequent shoots into them.
- b. Another Branch sent from the same Infolding downward, which stretches under the lower part of the same straight Intestine, and imparts to it frequent shoots.
- C.C. Two Nerves sent downward from the lowest infolding of the Mesentery Y, which being sent down into the Bason about the lowest cavity of the Belly, enter the two infoldings there, K.K. viz. one placed in either side.
- K.K. A double Infolding placed within the Bason, whose nerves provide for the several excretions there made, viz. of the Urine, Dung, and Seed: these send out nerves d.d. towards the lowest Mesenterick infolding.
- d.d. A nerve ascending from the aforesaid Infolding on either side, nigh the sides of the straight Intestine, inserts shoots into it: which double infolding, another nerve descending (b) from the least infolding, meets with.
- e.e. Two Nerves from the same Infolding into the Womb.
- f. A nerve from the same Infolding into the Bladder.
- g. A nerve into the Glandules Prostatæ.
- h. A nerve out of the Root of the eight and twentieth Vertebral pair into the muscles of the Anus.
- i. The nine and twentieth Vertebral pair, from which
- k. goes a Nerve into the Sphincter, and the other muscles of the Anus.
- l. A noted nerve on both sides from that pair into the Yard.
- m. Another shorter Branch into the muscles of the Yard.
- L.L. The intercostal nerve below the Reins.
- n. A little nerve from the Vertebral branch into the Cremasteral muscle of a Mans Testicles.
- n. The one and twentieth Vertebral pair, the beginning of which being placed behind the Kidneys, lyes hid. From this Nerve very many shoots are sent out on both sides into the testicles of the female Sex, which meet with other Mesenterick shoots, distributed to the same part.
- o. A Nerve from the two and twentieth Vertebral pair, out of which also are some shoots sent into the Womens testicles.
- P.P.P.P.P.P.P.P. Nerves destinated for the thigh, of which those that arise higher, receive in their descent branches from the nerves arising lower.
- q. The intercostal Nerves inclining mutually one to the other, near the beginning of the Os Sacrum, communicate by the cross Process.
- r. Another cross Process within the crookedness of the Os Sacrum knitting together the two intercostal nerves.
- s. Both the intercostal Nerves ending in most small fibres, which Fibres are distributed into the very Sphincter of the Anus.
- t. A Nerve from the twenty fourth Vertebral pair, which is carried into the inguinal Glandula's or of the Groyn.
- v.v.v. &c. Shoots sent down from the intercostal Nerve on both sides into the body of the Ureters.
- x. A Nerve which is destinated to the Testicles and the Cremasteral Muscle, cut off where it goes out of the Abdomen.

The Twelfth Table.

Shews the Spinal Marrow whole taken out of its bony Den, and half taken from the Membrane cloathing it, being dissected, that the beginnings and productions of all the Vertebral Nerves might be seen together.

- A.A. The top of the Spinal Marrow, where it is cut off from its cleaving to the oblong Marrow.
- B. The Spinal Artery seen to descend through the whole Marrow, which however is made up of Arteries, brought into it from between the several joynings of the Vertebrae.
- CC. The Spinal Nerve coming from the fifth or sixth Vertebrae of the Neck to the beginning of the wandering pair.
- D.D. Portions of the Membrane cloathing the Marrow dissected and rolled off.
- E.E.E. The Spinal Nerves sent out of the upper margine of the Marrow by bands, with which the like bundles also being carried from the lower margine, meet and joyn together all into one trunk within the junctures of the Vertebrae: then being separated again without them, they are carried into their respective Provinces.
- F.f. Nerves brought forth within the region of the Neck.
- G. g. Nerves destinated for the Shoulder and Arm, where both the Marrow is larger, and the bundles of the Nerves are greater.
- H.h. Nerves going out about the Back and Loyns: where both the body of the Marrow is again smaller, and the little bundles of the nerves are a little slenderer.
- I.i. Nerves destinated for the thighs, where also the medullar Body and the little bundles of the Nerves are again larger.
- K. Nerves going out of the Os Sacrum.

The Thirteenth Table.

FIGURE I.

Shews the branchings forth of the Vertebral Artery reaching out on both sides into the Superiour part of the Spinal Marrow, and into the hinder Region of the oblong Marrow.

- A.A. The Region of the posterior oblong Marrow.
- B. The common passage made from both the Vertebral Arteries united together.
- C. The Rhomboidal Figure, which in Brutes a double coalition of the Vertebral Arteries describes.
- D. The first joyning together of the Vertebral Arteries above the Spinal Marrow, from which place the Spinal Artery descends.
- E. The Spinal Artery.
- F.F. Two Vertebral Arteries carried from the axillary branches.
- G. The Spinal Marrow.
- f.f.f. &c. Arterious shoots into the muscles of the Neck.
- g.g.g.g. Shoots sent in the Spinal Marrow which joyn together from either side in the Spinal Marrow nigh the several joynings of the Vertebrae.
- h.h.h.h. Arterious shoots, which following the chanel of the Bosoms, make the arterious Infolding, as it is described in the third Figure.
- i.i. Two Arteries sent down from the Aorta into the Spine.

FIGURE II.

Shews the Vertebral Veins which are Companions to the abovesaid Arteries; also the upper portion of the Vertebral Bosom and the communications of either among themselves and lateral Bosoms of the Head, and between the Jugular Veins

- A. The third Bosom of the Head cut off, where it passes into its lateral Bosoms.
- B.B. The lateral Bosoms of the Head.
- C.C. The round Den where the lateral Bosom goes on both sides into the Jugular Vein.
- D.D. The Jugular Vein.
- E. The upper joynts of the Vertebral Bosoms.
- F.F. The Vertebral Bosom on either side within the Skull brought through, and there passing into the lateral Bosom.
- G.G. The Trunk of either Vertebral Vein brought from the Vena Cava, and there beginning.
- H.H. Either Trunk of the Vertebral Bosom there cut off, which lower is continued through the whole passage of the Spine.
- h.h.h.h.h. The joinings together on both sides within the Commissures of the Vertebrae between the Vertebral Vein and Vertebral Bosom.
- i.i.i.i. The Veinous passages, which reaching out before without the Vertebrae, are carried from the Vein of one side to its fellow of the other side.
- 1.1. The communication of all the Bosoms and Veins in the top of the Spine.
- k.k. The Veinous passage from the concurrence of the Bosoms and Veins on both sides into the Jugular Vein.
- l.l.l.l. &c. The joinings together of the Bosoms of either side near the Internodia of the Vertebrae.
- m.m.m.m. &c. The passages of the Veins carrying back the Blood from the Spinal Marrow into the Bosoms.
- n.n.n.n. &c. The Chanels of the Veins carrying back the Blood from the muscles of the Neck.

FIGURE III.

Shews the Spinal Artery which is produced within the bony Den nigh the more inward Superficies of the Marrow, from the hinder part of the Head to the Os Sacrum, in the shape of a Net-work pul.

- a.a.a.a. Arterious shoots sent towards the Spine from the Vertebral Artery ascending between the holes of the Spinal Processes.
- b.b.b.b. &c. Arterious shoots sent from the Aorta towards the Spine.
- c.c.c.c. &c. An Arterious shoot reaching out of every of the aforesaid shoots into the posterior Marrow.
- d.d.d.d. &c. Another shoot reaching out of every of the aforesaid shoots into the anterior Marrow.
- e.e.e.e. &c. Every the aforesaid Arterious shoots, as soon as carried into the bony Den becoming forked, send forth a little branch into either part, which on both sides communicates with the next branch of the same side, and by the cross Process with the fellow-branch of the other side.
- f.f.f.f. The joinings together of the Arteries of either side by the cross shoot.
- g.g. The Arterious shoots going out of the Os Sacrum.
- h.h. Arterious shoots into the Meningæ of the hinder part of the Head.
- i.i. Arterious shoots going out of the Skull with the Nerves of the seventh pair.
- k.k. Shoots reaching out into the wonderful Net, which in their progress are ingrafted mutually among themselves, and also with the Arteries Carotides.

FIGURE

FIGURE IV.

Shews the Branchings out of the Spinal Bosom in its whole passage.

- A. The uppermost joyning of the Bosoms of either.
- B.B. Channels reaching out of either Vertebral Bosom into the lateral Bosoms of the Head.
- C.C. Channels brought from the common concourse of the Bosoms, and the Vertebral Veins into the Jugular Veins.
- D.D. The Vertebral Veins.
- e.e. A communication between the Spinal Bosom and the Vertebral Vein.
- f.f.f.f. The passages of the Veins from either Bosom into the Trunk of the Vertebral Vein.
- g.g.g.g. &c. The like Venous passages which are continued lower into the branches of the Vein Azygos, and lastly into the lumbar shoots of the Vena Cava.
- h.h.h.h. &c. The Pipes of the Veins, which receiving the blood from the Spinal Marrow carry it back into the Bosoms.
- i.i.i. &c. The commissures or joynings of the Bosoms of either side nigh the several joyntings of the Vertebrae.

FIGURE V.

Shews the Image of the Spinal Bosom in a Dog, which hath not joynings together in its whole passage, as it is in a Calf, Sheep, Hog, and many others, but only in the lowest and uppermost part, where it communicates with it self by three or four cross Processes.

THE CONCLUSION.

TH U S much for the Anatomy of the Brain and Cerebel, and of their Appendix, both Medullar and Nervous, and of the Uses and Offices of all the several parts, of which we have largely treated. There yet remains, after we have viewed, not only the outward Courts and Porches of this Fabrick, as it were of a certain Kingly Palace, but also its intimate Re-cesses and private Chambers, that we next inquire into, what the Lady or Inhabitant of this Princely place may be, in what part she doth chiefly reside, and by what Rule and Government she disposes and orders her Family. Then we ought to take notice, what defects and irregularities happen to it, or its parts and powers; then to what injuries of changes or Diseases this Building or House, to wit, the Brain and nervous Stock, may be obnoxious. For indeed I am as it were bound, by reason of the Work it self, and the promise I made before, that for the Crown of the Work, a certain Theory of the Soul of Brutes should be added after the naked Anatomical Observations and Histories of Living Creatures, and of their animated Parts. Truly it is but just and equal, that we enter upon this Discourse of the Soul; and that other task of *Pathologie*, to wit, that the Asperities and hard sense of our already instituted *Anatomy* may be sweetned with those kind of more pleasant Speculations, as it were cloathing the Skeleton with flesh; and that the Reader being wearied by a long and troublesome Journey, may be a little refreshed and recreated. For in truth, whatsoever of our Work is performed without form or beauty, may seem as the Foundation of a Building only placed on the Ground, in which no elegancy or neatness doth shine, but that all things appear rude, and as yet built of rough and unpolished stones. A Superstructure indeed may be promised to be put upon this Foundation, perhaps fair and beautiful, whereby the minds of the Beholders may be pleased and instructed. But truly this kind of work may be too hard and great to be performed by our weakness: neither doth it become me to proceed in my undertakings, before these have undergone the Censure and chance to which they are subject. For I fear, lest this Foundation, but now laid, should become too weak and feeble for the sustaining an higher Fabrick, at least until this hath for some time undergone the tryal, by lying open to winds and storms.

F I N I S.

A N

ESSAY

OF THE

PATHOLOGY

OF THE

BRAIN

A N D

Nervous Stock

In Which

Convulsive Diseases

Are Treated of,



Being the Work of *THOMAS WILLIS* of *Christ-Church*
in *Oxford*, Doctor in *Physick*, and *Sidly-Profeslor* of
Natural Philosophy in that Famous Academy.

Translated out of *Latine* into *Englisch*, By. *S. P.*

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PHILOSOPHY

OF THOMAS

PHILOSOPHY IN THE

OF A. M. and R. R. for

The Authors Epistle Dedicatory,

*To the Most Reverend Father in Christ, His Grace,
Gilbert, by Divine Providence Archbishop of Canterbury,
Primate and Metropolitan of all England, and One of His
Sacred Majesties most Honourable Privy Council.*

IT is so Ordained by the Laws, most Noble Prelate, that whatsoever shall happen to be built upon any ones ground, it shall be his own by right of accession. Since therefore, to that work which I lately attempted, concerning the Gifts and Nature of the Sensitive Soul, as also the Affections of the Brain and Nervous stock, and the various Diseases which belong to them, I had placed the Anatomy of the humane Head for a foundation; it was altogether necessary (this Treatise being Dedicated to your Grace) that whatsoever building should be raised on that Foundation, should truly and rightly be said to be yours: And so indeed, we continue the fault we had sometimes Committed; and it becomes not only a step, but what is more, an obligation to the following Crime; that at length, we seem rather to perform a Duty, the name of a fault being lost, than to become Criminal.

But in the mean time, this matter in which I busie my self, may not be said to be unfit for your Knowledge, or to be disagreeing to the business of the Church, over which you most happily preside; For both those Epilepticks which are to be met with here, precipitating themselves into the water or the fire, and those whose members variously contracted and distorted with Spasms or Convulsions, and those whose whole Bodies so bent, that they could not stand upright; by and by, as if by Inspiration of the Devil, they are agitated with Stupendious leapings, and other wonderful gesticulations: These, I say, and many other Sick men whom I here every where describe, seem not much to differ from those whom we read of in the Evangelists to be cured by our Lord Jesus Christ; and although such be to be cured, however contumacious and rebellious they are, the Physitian, however Skilful he be, ought always to implore the help of the Heavenly Power, to be assisting to him, being above all the Strength of Medicines. Therefore, and by right the Disease by the Ancients called
Holy

Holy of the word *Theoria*, and the rest of our Pathology, as if it contained in it a certain Divinity, explicates the Disease to be cured no less with prayers and fastings, than with Medicines, and therefore should desire greatly to call upon the Authority of Holy men, and to be helped by the Power of your Sanctity.

Besides, it is no new thing that there should be an Entrance into the Church thorow the Spittle; for that it appears, our Saviour to have used almost this method, who would for the most part, that the health of the Soul, should take its beginning from the restored health of the Body. And truly, as the Stupid *Diliriums* of Melanchollicks, the Caninish madness, and others sprung from an infirm Brain, have driven some, both from the Communion of Saints, and from the Society of men, if these had been profligated by the help of our Art, it would not be despair'd of but that the men should not only, growing well, have left both at once their Diseases and Errors, but also should have become wise.

It remains, that I Supplicate the Great God, That he will render to his Church, the peace he has happily given to the Commonwealth, that he may take away the darkness from the eyes of the miserable people, that he may withdraw the fury from their minds; and for a pledge and advantage of so great a benefit, that he may long keep safe and in health, your Grace, the mighty Pillar and Glory of the Reformed Religion, which is Cordially desired by,

Your Graces most humble

and Devoted Servant,

T.W.

OF

Of Convulsive Diseases.

CHAPTER I.

Of Spasms or Convulsive Motions in General.

IN handling the Convulsive Distempers, many Physicians distinguish between the *Spasme* or *Convulsion*, and *Convulsive Motion*; by the first they understand a constant Contraction, whereby the Member becomes stiff and inflexible; by the Second, swift motions, and Concussions, which, coming between, cease, and return alternately: But neither those who have observed these notes of difference, nor other Authors, have taken notice that they are continual: for that by the words *Spasme*, and *Convulsion*, they often design a certain Spasmodick or Convulsive Affection; wherefore to distinguish it better, we will call the former distemper with *Cardan*, *Tetanon*, a continual Convulsive Cramp; but the other *Spasme*, or a *Convulsive motion in general*.

But that the irregular Nature and Causes of Convulsive motion, might more rightly have been made known, it should first have been declared, after what manner the regular motive function is effected in an animated body: but the more full Consideration of this, because it belongs to the Physiologie, or Reasoning of the Nature of the Brain, and Nervous stock, it is deferred to another Discourse: For the present, we will signify in a word, as much as shall serve for the elucidation of the matter proposed. That the animal Spirits are the next instrument of regular motion, and that their Action, or moving force, consists only, in that they being more thickly heaped up together, in the motive part, and there spreading themselves in a more large space, they blow it up, and intumesc it; which for that reason, being contracted, as to its length, draws to it self the part hanging to it. In our description of the Nerves already published, we have shown this kind of motion to be twofold, to wit, Spontaneous, and meerly natural, the Instinct of this is derived from the Cerebel, but of that from the brain, but both through the pipes of the Nerves, as it were the channels, both to the muscles, and also to the fibres, interwoven with the membrains, and other motive parts of the *Parenchyma*, or inwards; Lastly, in all these, the various actions are so expeditiously effected, which either natural necessity, or the rule of the will requires, by that only means, that there is an intimate Conjunction, and communication of Duty, and most swift Commerce, between the animal Spirits, which constitute the *Hypostasis* of the sensitive Soul, within the foresaid parts, disposed, or fitted by a continued Series. But there is this notable difference between the motion of a muscle, and that performed by other parts; for in these the action is most often circumscribed within the bounds of the motive body, so as its membranes only, or one part of the inward moves another, and consequently this is moved of its neighbour: But in the musculous stock, usually the moving part is placed in one member, and to be moved of another next it (although within some musculous part, as the Heart and *Diaphragma*, they properly for the most part move themselves only) hence the Membranes and inwards, are said to have as it were an intestine and vermicular Motion; such as wherever it is begun, the Spirits there more thickly gather together, and spreading themselves forth, they first intumesc this part, then going forward another, and so farther, till at last they draw the hindermost parts, and by this means transfer an intumescence, and therefore a motion, from one place to another; almost after the same manner as worms, and other creeping creatures make their progression. But to this motive function of the Membranes and Inwards, if it be frequent or undiscontinued, plenty of spirits are required, which notwithstanding execute their task calmly enough, without tumult or great force: And indeed it is to be observed, that the Animal Spirits flow not more sparingly into the Membraneous Inwards, than into the Muscles; as it appears from the more exquisite sense of those parts, and by the manifold insertion of Nerves within them, and the diversity of divarication, through the foldings and fibres, altho in the mean time the muscles are watered with a more plentiful influx of Blood: But as to the motion, performed in the musculous stock, the heaping together, and rarefaction of the Spirits, through the whole jointing of the motive-

How the regular Motion is Effected.

Its beginning twofold.

The Subject also twofold.

The Motion of
a Muscle is a
certain explo-
sion of the spi-
rits.

tive part, suddenly and unfolded, are performed with such force, and strength, as the attraction of the muscle, in its motive endeavour, may exceed the force of a pulley or windlace; and when this force only depends on the expansion or rarefaction of the Spirits, seated in the motive part, we conceive it to be no otherwise, but that the Spirits so expanded or stretched forth, as it were fired, after the manner of gunpowder, to be exploded or thrown out. But we may suppose, that to the spirituous Saline particles, for the spirits inhabiting the interwoven fibres in the muscle, other nitrous sulphureous particles, of a diverse kind, do come, and grow intimately with them, from the arterous blood, flowing every where within the same fibres. Then as often as the particles of either kinde, as *Nitre* and *Sulphur* combined together, by reason of the instinct of motion brought through the nerves, are moved, as an inkindling of fire, forthwith on the other side bursting forth, or being exploded, they suddenly blow up the Muscle, and from thence cause a most strong drawing together; for indeed it seems to be ordained for this end; that the Muscles are imbued much more plentifully with the arterous blood, than the membranous inwards; to wit, that the Elastick coupling of the spirits, being consumed, and perpetually falling off, through the very often, and sometimes continual motion, might be by that means supplied, from the fresh sanguineous juice: in the mean time, that the spirits themselves, being supplied in a smaller quantity, through the small nerves, might even like old Soldiers continue longer in the same station, and follow their manifold coupling or labour. How else are labouring beasts supplied with a sufficient stock of spirits, for so much labour; whilst they exercise almost all their muscles, by a swift course for many hours, yea sometimes a whole day? or who can believe that a little handful of spirits brought through the small branches of the wandering and intercostal pairs of the Nerves to the heart, can be able by their own strength to effect that its so strong and indiscontinued motion? Indeed it seems, that of necessity there must come to them from the blood, perpetually, auxiliary aid, and those afterwards to be always exploded. For this reason certainly, the motive virtue, both of the Heart, and the rest of the Muscles, becomes more strong and Elastick, above any mechanick Organ: to wit, for as much as the animal spirits, acting every where in the muscous stock, get to themselves an explosive *Copula*.

If any one shall be displeased at the word *Explosion*, not yet used in Philosophy or Medicine, so that this Spasmodick Pathologie, standing on this basis, may seem only *ignotum per ignotius explicatio*, an explication of unknown things by more unknown things; it will be easie to shew the effect of this kind of notion, and very many examples and instances both concerning natural and artificial things, from the Analogie of whose motions, in an animated body, both regularly and irregularly performed, most apt reasons are to be taken. For besides the mixtures of *Nitre* with *Sulphur*, with *Tartar*, and with *Antimony*, all which are fired with a thundring noise; also *Aurum fulminans* or *fulminant Gold*, and a Composition of salt of *Tartar*, with *Nitre* and *Sulphur*, without any actual fire, being only thoroughly heated, are exploded with a vehement Crash; also to this may be referred, many Liquors, which being mixed together, or poured upon some certain bodies, cause or stir up violent motions, and plainly explosive: The spirit of *Nitre*, and the Liquor of congealed *Antimony*, being poured on one another, or either of them thrown upon the filings of *Iron*, cause a great *Ebullition*, with heat and black Smoke. It is commonly known, what heat or effervescency, and force plainly explosive, arise from fixed Salts melted together, and from acetous or sharp salt of every kind, mixed with one another: Nor is the effect of Explosion less seen, when a liquor imbued with a volatile Salt, as the spirit of *Harts-horn*, or of blood, is put to a saline, either fixed or acetous *Stagma*, or sulphureous *Nitre*, to wit, the particles being vehemently stricken one against another, leap up with a force, and on every side are carried forth, a great way; which without doubt, if they were restrained within the space of any body, as the fibres of a Muscle, they would suddenly intumescit it, and so would constitute an instrument of local motion. Concerning this thing, we have more fully discoursed already in our *Neurologie*, or Tract of the Nerves, and perchance we may yet publish the explication of this more fully and more accurately some other time.

In the mean time that this opinion may not be thought altogether new, and that I have exposed it as a child of my own brain, that had no other Patron, I will here shew you the assertion of the famous *Gassendus*, which as it openly favours our Hypothesis, and in some sort gave an occasion of it; so, perhaps it will give to it some Authority. Therefore this Rational man, weighing in his mind, how much that force or strength might be, with which not only the Arm, or Thigh, but the whole animal Machine, is moved, governed, lifted up, and carried up and down: He adds, Who can easily comprehend that small thing, whatsoever it is, within the body of an Elephant, whether we conceive it to be a soul, or spirit, or any other beginning of motion, that it should be able to agitate such a bulk; and so

cause it to perform a swift and regular dance? and so much the more, for that, when as that small thing within that body, no longer flourishes, there is need of somuch outward strength to remove it never so little from its place: but indeed, the same fiery nature of the soul, serves within the body, by its own mobility, the same thing in proportion, that a little flame of Gunpowder does in a Cannon: whilst that it not only drives forth the Bullet, with so much force, but also drives back the whole Machine with so great strength. But indeed he says as to the spirits, which (like exploded Gunpowder) cause the agitation, it is doubtful whether it be they which come from the brain, or those in the little tendons as it were of kin to them, or springing from them, that are thought to do it: But altho either of them concur, yet they seem to be more presently destined to this office, which are those of the same kin or off-spring in the Tendons. There needs no more, it is declared, that the motive function depends on the Elastic Copula, of the animal spirits, and its decision or abating. But from this being supposed, (which indeed we may suppose with very great probability) it easily follows, that the convulsive motions proceed from the like cause: For whosoever shall consider the sudden puffings up, the violent and strong Contractions in the members and affected parts, yea, sometimes the most impetuous concussions, and violent throws of the whole body, can conceive no less, than that very many heaps of the animal spirits are exploded, or thrust out, even as lightning breaking forth from a Cloud. Further from hence it may be Argued by a reciprocal Argument, that because the Spasmodick motions are explosive, that therefore the regular are also produced by the explosion of Spirits: But after what manner, and by what means, and from what causes, the animal spirits being exploded, or thrust forth, produce Spasmodick Affections, shall be our present business, a little more largely and plainly to demonstrate, however difficult and abstruse the matter seems to be.

We will not here stand to recite many opinions of others, concerning the Nature and causes of a Spasm, or Convulsion; that which was most common, and long famous among the Ancients, that this distemper was only produced from repletion or inanition, or from fulness or emptiness, (however, besides the authority of *Hipocrates*, for the establishing of this, an example is brought, of a Skin, or the strings of Lutes, which are wont to be contracted, being either filled with a moist, or emptied by too dry an air) easily falls of it self; because it seems to suppose (that which is credible to none by Experience, the fragility of a Nerve) to wit, that the Nerves themselves, after what manner so ever abbreviated, and contracted, are able with a certain force to draw to them the Muscles. If that it shall be said, that the repletion or inanition, ought to be understood, in respect of the solid parts, which were wont to be drawn together; it may be observed to the contrary, when as the Muscles and Nervous stock are very much watered with a watery humor, as in an *Anasarca*, or are plainly destitute of the same, as in the consumption, or *Mirasmus*; yet no convulsive motions are for that reason excited: among the moderns, very many have determined irritation of the Nervous parts to be the cause of Convulsion; taking their Conjecture from thence as I suppose; for that by ocular inspection it appears from the Vellication it self, and by the only touch of the Nerves, that spasms are induced: And indeed we have clearly observed in the dissection of a living whelp, that the knife being put upon the naked ends of the spinal Nerves, presently both themselves, and the Bodies of the Muscles in which they were inserted, were hauled: neither is it unusual, that spasms are excited almost in every man, by the punctures of the Nerves and Tendons. I remember by reason of an Ulcer in the arms of a certain man, that the Tendons of the Muscles were laid open, which when touched by the Surgeons Instrument, caused in the Patient a certain rigor through his whole body, and forthwith a Concussion arising, made him to quake for a good space. But in truth, albeit we grant the irritations of the Nervous parts, not seldom to serve the turn of the evident cause; and further that sometimes this solitary cause produces more light and transient spasms; nevertheless, that the more grievous paroxysms of this Disease, and their frequent repetitions by turns may be duly unfolded, it behoves us to investigate, or search out other and deeper causes, to wit, the conjunct and procatartick Cause.

Forasmuch as spasms never happen but in a living Body, where the Nervous parts are blown up, and grow turgid with the animal Spirit, we may readily conjecture that those animal Spirits themselves are as in regular motion, so also in the Convulsive, the next Instrument of Action: to wit, so long as they are imbued with a fit and moderate explosive Copula, and are moved to that striking forth, only by the command of the Appetite, or instinct of nature, they bring forth motions altogether regular; but if the same Spirits get to themselves an heterogeneous Copula, and too much Elastic, or if they are snatched into their Actions more impetuously and vehemently than they should be; they even like unbridled Horses, pricked forward with Spurs, leap forth inordinately, or throw off, or explode violently their Copula, altho genuine and natural: and so they

There is a double Cause, and two kinds of Spasms. Irritation.

they carry away the containing parts, as it were a Chariot tied to them, together with themselves, with a fierce and perverse motion.

When therefore, as aforesaid, the Convulsive motions are chiefly stirred up for two Causes, hence as many Species of them are ordained. For first, it happens that a Convulsion is induced without a procatartick Cause, or heterogeneous *Copula*, first acquired only from a solitary evident cause: For so a vehement passion, impressed on the brain, a dissolution of the parts, hapning somewhere in the Nervous stock, a spasmodick passion is suddenly brought upon some, whose brain and Nerves are of a more weak constitution: for that the animal spirits do trouble the containing parts, the impropionate Object flying from them, and by striking vehemently their *Copula*, though very agreeing, it blows them up, and so they pull others annexed to them: Spasms being after this manner excited, because the natural *Copula* of the spirits in them is stricken more vehemently, they are after a manner explosive, which notwithstanding, quickly leave off, and very often pass away with moving of the Viscera, or Members; only with a trembling, and some horror, into a fainting of the spirits. But Secondly, Convulsions, whose paroxysms are more grievous, and stay longer, or are oftener repeated, seem altogether to depend on a procatartick cause, or a previous disposition, and to arise from some other conjunct cause, besides Irritation. And therefore in this case we suppose, that the heterogeneous, and greatly explosive particles, do increase with the spirits, acting in this or that region of the Body: then from this wicked Combination, and restless Collision of this kind of matter, and the spirits frequent and vehement explosions being brought forth, the spasmodick Paroxysms are induced.

A preternatural explosive Copula.

But besides the Elastic *Copula*, which every where happens to the spirits, from the arterous Blood, and from whose orderly explosion the motive force is performed, according to the Book of the Appetite, or instinct of Nature, in all the Nervous parts; (as we have elsewhere declared) also sometimes other kind of little bodies, of a fierce nature, or rather like *Gun-powder* or *Nitre*, come to the spirits, and intimately adhere to them, when frequent and suddain divorces of this matter, from the Embraces of the spirits, happen from the mutual striking together of the particles, the containing Bodies are variously blown up, and so are thrown into Convulsive motions. In truth, as often as the Spasmodick Affection becomes habitual, that the Convulsive Paroxysms arise not rarely on their own accord, and without any evident cause, but still on every light occasion; the procatartick cause of such a Disease, consists in the evil disposition of such a sort of animal spirits: For neither is the Serous filth, or other less sharp humours, although deposited in the very ventricles of the Brain, or about the origine of the Nerves, sufficient to stir up such a sickness: For that I have seen in the heads of dead people, oftentimes the middle part of the Brain, and the very beginnings of the Nerves, wholly covered with a limpid water, who, whilst they were alive, had neither the Epilepsie, nor Convulsive Motions: But to the producing of these motions, very active Bodies are required, such as are Saline, and Sulphureous, which being combined with the spirits, and then on a sudden breaking from them, they imitate the combinations and violent explosions of particular Minerals. For indeed, if in regular and ordinary motion (as we have intimated) the Muscles cannot get a motive force, and elastick strength, unless a certain explosion of the animal spirits be supposed, certainly much more lawfully may we assert, that epileptick fits, and other admirable Convulsions, which still happen to be excited, complications of the same spirits, with other very fierce particles, and vehement elisions, or strikings of these one against another, are required. But, as to this kind of Spasmodic *Copula*, because it differs from the natural and ordinary, which we have elsewhere shewn to be in regular motion, and to be supplied from the blood; it behoves us to inquire from whence it comes, and by what means and in what places it is wont to get to the spirits.

As to the first, it is to be observed, that Spasmodick explosions do every way happen, in the Muscles, to which only they are limited, which effect the regular motion; but also in the Membranes, to wit, the Ventricle, Mesenterie, and other parts almost without blood: besides, that the explosions themselves, in the Convulsive Affection, though they are excited contrary to the will of the Appetite, and the manner of Nature, are far more vehement, and do longer continue, than in the irregular motion: out of which it seems to be manifest, that the Explosive Spasmodick *Copula*, doth come from some other place than the Effectrice of Regular motion: And indeed, it is probable, that that flows not, as this, from the arterous blood, running every where among the Musculous fibres, but descends from the Brain, with the Liquor watering the Nerves, and so is heaped up, about their beginnings, middle, processes, enfoldings, and Extremities, as it were the Mine of the Convulsive Disease. Indeed nothing appears

The explosive Spasmodic Copula, not immediately from the Blood, but from the Brain.

appears more evident, than that the Spasmodick Disease doth most often arise by reason of the evil first fixed in the Brain, and from thence is transmitted into various parts of the Nervous System: for it happens from hence, that a vehement Passion, as of Fear, or Anger, or of Sadness of spirit, affecting the inhabitants of the *Encephalon*, the passion called Hysteric, and Hypochondriac, doth so often arise: Further, that in the evil Crises of Fevers, when the adust recrements of the blood are transfer'd into the head, Convulsions do generally succeed. Moreover, and this is the reason, why the Vertigo, the inflation of the head, torpor of the mind, and other accidents of the Supreme Region, are wont to be the *procurium* of Spasms presently following in the Inwards, and not seldom in the whole Body. Wherefore it is not to be doubted, but that the heterogeneous and explosive particles, are instilled from the Blood, together with the Nervous juice, into the Brain; which afterwards being thrust forth into the Nervous stock, do there grow to the spirits, and with them bring on a Convulsive disposition. In truth, the Spasmodick distempers, which are either universal, or at least occupy many parts of the Body at once, arise for the most part, by this only means. But in the mean time, we will not deny but that particular Spasms, which contain themselves within certain places, the dead being no ways affected, are induced sometimes by other means. For if the Nerves imbibe their humour from either end, to wit, the root, and the extream fragments, (which both the learned *Glisson* maintains to be most likely, and by us is shewed in our Neurologie, not without great probability) it may be from hence infer'd, that the Spasmodick particles are brought inwardly, not only from the beginning of the Nerves, but somewhat also by their extremities: Therefore that perhaps appears clear and plain enough, that from the Spleen being evilly affected, Spasms arising about its Region, do not seldom affect the *Hypochondria* and *Præcordia*. I have known some, from a Tumour or Ulcer existing in the Mesenterie, Womb, and other inwards, were wont to have Convulsions both in the grieved part, and also all about it; the reason of which seems to be no other, than that the heterogeneous particles being more plentifully heaped up in the affected place, creeping also into the Nervous fibres, planted nigh thereunto, supply them with matter for Convulsive motions like to fired Gun-powder: But indeed, Spasms arising from such a cause, are not wont to diffuse themselves far about, nor always to ascend to the Head.

Sometimes received from the ends of the Nerves.

These things being thus premised, concerning the inward and next cause of the Spasmodick Distemper, which we affirm to arise chiefly, and most often from the head it self, and in some respect also from the extremities of the Nerves; it now remains, that we more particularly declare, the various remoter Causes in either kind, and the manifold provision of this Disease. The Convulsive Disease therefore, for the most part, takes its Original from the head: to wit, as often as the heterogeneous and explosive particles, being diffused from the Blood into the Brain, or its medullarie Appendix, are afterwards derived to the Nervous stock, and there grow together with the spirits: But this happens to come to pass from various causes: for there are very many ways and means whereby the Morbifick matter is admitted into the head, and very many also, whereby it is deduced into this or that region of the Nervous System; and according to the various Translations of this kind of morbifick matter, the divers kinds of Convulsive motions are constituted.

The more remoter causes of Spasms.

Therefore, that the Heterogeneous and Spasmodick particles are admitted into the *Encephalon*, it is to be imputed to the fault both of the Blood sending, and of the Brain receiving it.

1. The morbid matter is heaped up within the Head, by the default both of the blood sending.

1. When the Blood pours upon the Head the Morbifick matter, either all its whole mass is depraved, as it frequently happens in malignant Fevers, also in the Scorbutick, Cacoehymick, and chiefly in an Originally corrupt Distemper; or the Blood of it self innocent and incorrupt, receives elsewhere Malignant little bodies, and afterwards fixes them on the brain; so in great impurities of the Inwards, and chiefly when any parts are affected with an Inflammation, or virulent Ulcer, or hurtful Ferment; for from such Mines the taint of the Disease, the noxious particles, bubble up into the Blood, and afterwards, in its passage, are laid up in the Brain: So, by that reason the Spleen, Womb, and other Inwards, being evilly affected, Convulsive Diseases are excited, which notwithstanding, depend more immediately upon the Brain, receiving the corruption of those parts, through the commerce of the Blood.

2. But in the second place, the Blood however vitious it should be, and impregnated with the Morbid seed, it could not easily leave its Infection on the head, unless there were some fault in the constitution of the Brain, and its Appendix; as long as these parts are well made, and are full of vigour, they defend themselves, and what belongs to them; and the doors being shut, they admit nothing but an unmixt spirituous Liquor,

And also of the Brain receiving it.

quor destined for their use : but if either the passages and pores of the Brain are too lax, or the door-keeping spirits leave, or are called off from their watches, and Heterogeneous and Morbific matter creeps in together with the Nervous juice, and unfolds its malignity in the animal government. As to the evil disposition of the Brain it self, it is sometimes hereditary : So those sprung from Parents obnoxious to the Epilepsie, or Convulsions, are themselves for the most part prone to the same Distempers : and indeed, the constitution of the Brain may several ways become vitious from the birth : for either its temperature is more moist, or more dry than it should be, or it may be faulty by the excess or defect of either quality. Sometimes the pores are more lax, or its consistency is too soft, or too hard : and also the Conformation of the parts of the Brain, and its Appendix, may be after an undue manner ; But sometimes, the disposition of the Brain and Nerves, originally whole and firm, is vitiated by accident, and acquires a Morbid inclination : long Intemperance may enervate these parts : as also Malignant Fevers, and Chronical Diseases, very much debilitate them : besides outward accidents, as the excess of heat or cold ; an Ulcer or a blow oftentimes perverts their Crases, and renders them more incident to the impressions of Diseases. But as to the constitution or irregularities of the animal spirits, by reason of which, the Heterogeneous and Spasmodic particles enter the Brain without any repulse, and more easily cleave to it ; it is to be observed, that the animal spirits are in some more tender, and easily dissipable from their very birth ; so that indeed they are not able to suffer any thing very strong or vehement to be brought to the sense or imagination, but straight they fly into confusions : For this reason, women more than men, and some of them more than others, are obnoxious to the passions called Hysterick. Further, sometimes a violent Passion impresses on the spirits, though moderately firm, this kind of dissipation and inordination, so that afterwards they are able to suffer nothing strongly, or to resist any injury : So it often happens, that Morbid impressions are affixed on the animal regimen, by sudden fear, or great sadness, which can hardly ever after be blotted out : for from hence Women often contract first the Diseases named the *Mother*, or from the *Womb* ; and Men the *Hypochondriack*, and are for the most part still subject to them.

The evil disposition of the brain is either hereditary,

2. How the Morbific matter being admitted within the head is disposed.

Sometimes it is carried back again from the brain.

Sometimes it is thrust out into the Nervous stock.

Remaining in the brain causes the falling-sickness.

The Spasmodic matter being fallen on the nervous stock.

From these things it appears, after what manner, and for what causes, the Spasmodic Matter is wont to be admitted into the Head : now let us see next what is done with it afterwards ; if that this matter brought to the Brain, induces the Convulsive Distempers, either not always, or not altogether after the same manner.

1. It sometimes happens, that the Heterogeneous and Explosive Particles are admitted into the Brain, which notwithstanding are again exterminated without any great hurt, and before they enter into the Nervous stock : for that the Veins and Lympheducts, or water-carrying Vessels, often sup up what is superfluous, and an enemy to the animal dominion, and convey it forth of doors, or dispose of it into Emunctuaries, or Sinks. Whilst such a Matter is for a little while agitated in the Brain, its Particles being affixed to some of its Spirits, and at length striking against them, cause the *Vertigo*, and the swimming in the head ; but because they enter not into the passages of the Nerves, Spasmodic Distempers do not follow.

2. When the Morbific Matter is admitted within the Head, and not presently from thence sent back, oftentimes it produces not its evil, till it is inserted into the stock of the Nerves ; for the animal Spirits within the Brain, being as yet strong, and having got a more free space, they evade the embraces of every Heterogeneous Copula ; which indeed they are not able to do within the strait channels of the Nerves : Besides, the Morbific Matter it self, if it cannot be sent away out of the Brain by the excretory Vessels, it is by and by sent forth to the System of the Nerves, as the more ignoble part ; but if in spite of the force of the superior faculties, such a matter stays long within the Brain, it much infects the spirits that inhabit it, and induces the Epilepsie, as shall be more particularly shewed hereafter : but more often, the hurtful matter is thrown on the Nervous stock, from the Brain, without much harm to it ; but this happens to come to pass not always after the same way.

For truly, the Heterogeneous Particles, being mixed with the Nervous Liquor, and fallen towards the beginnings of the Nerves, do not indifferently enter all of them together, or these, or those, as chance shall guide them, but they are directed to the passages of some before others, and that not without some Reason. For we observe, that the Convulsive Symptoms do chuse for the most part one place in Children, another in riper years, and a different one in more tender, than in the more robust.

In Children, who are not yet accustomed to the Affections of the Heart, and exercise of the outward members (whereby the Morbifick cause may be further carried from the brain) the Spasmodic matter runs more often into those nearest Nerves, viz. the third, fifth, and sixth paires; wherefore, their faces and mouths, and those parts; are chiefly handled: and it is rare and unusual for them to have their *viscera*, and *præcordia*, lifted up, or affected, with an inordinate motion, as in those of riper years: on the contrary, in men of more advanced years, by its approach to the intercostals, and the Nerves of the wandering paires, it being more open to those of the spinal marrow, which those Nerves respect, are wont to be more frequently pulled: but yet with this difference, that in the more tender, and those who are very delicate, and subject to passions, and who by reason of the passions of the mind, have very often their *præcordia* and *viscera* disturbed, the Spasmodic matter more readily enters the more open passages of the interior Nerves, and therefore they are rendered more obnoxious to Spasms, stirred up in the *Abdomen* and the *Thorax*: for hence it is that Women are molested with the Passions called Hysterical, and some men with the *Hypochondriack*; as shall be more largely declared hereafter, when we come to treat particularly of these Distempers.

Afflict the fore-parts of the Nerves in Children.

Otherwise in those of riper years.

When the Spasmodic matter falls upon the heads of some Nerves, or remaining there, it creates only a giddiness, and lighter *Spasms*, and leaping of those parts to which these Nerves belong, or being slid down more deeply into the pipes of the Nerves, it brings forth more cruel Convulsive Paroxysms: but the same being dilated into the Nervous processes, is disposed through one or more of the branches of the stock or trunk, sometimes all, and sometimes only those more open than the rest, and by degrees cleave to the spirits, both within those Nerves, as also to those planted within the hanging *Fibres*: so that it is after the same manner, and there is the like preparation in the disposition to Convulsive *Paroxysms*, as if grains of Gun-powder were laid in a long train to be fired successively: The spirits after this manner imbred with an Heterogeneous *Copula*, are lodged within the *Fibres*, interwoven with the Membranes and Muscles, but chiefly within the Nervous foldings; and when they grieved with too great plentitude, or troubled on any other occasion, are compelled to shake off their *Copula*, the Particles striking and leaping one against another, hugely blow up the containing parts; and so excite a motive force, contrary to the commands and laws of the Appetite and Nature: Besides, the spirits once stirred up to the performing Convulsive motions, begin their Explosions from the one or the other extremity of the Nervous System; but for the most part at the end. But they who are first exploded snatch or take with them their neighbours, also predisposed like a fiery train; and so they propagate the begun affection, with a long continued series of Spasms, from one end to the other: For a Convulsion begun in the bottom of the belly, or at the foot, or hand, creeps by degrees to the upper parts, and for the most part to the head it self: and the same Distemper when it begins in the brain (as in the *Epilepsie*) is derived in like manner thence downwards, to the remote *Viscera*, and also to the exterior Members and Limbs.

After what manner it disturbs the spirits, whilst it stays near the beginning of the Nerves, or being fallen more deeply into their passages.

The spirits enter into explosions, by reason of plentitude or irritation.

The Morbifick matter, flowing in the heads of the Nerves, produces divers kinds of convulsions, according to their various plenty and dispensation; For first of all, it is to be observed, that the whole passages of the Nervous System, or of some of its parts, through the abundant and exuberant matter, are sometimes possessed, so that the animal spirits both flowing in, and there implanted, being full of an Heterogeneous *Copula*, and a perpetual supplement of it, are urged into continual Spasms. I have known some who have had all the Muscles and Tendons through their whole Body afflicted with contractions and leaping without intermission: I have known others whose Thighs, Arms, and other Members, were perpetually forced into various bendings and distortions: and also others I have seen, who of necessity were compelled to leap and run up and down, and to beat the ground with their feet and hands; and if they did not, they fell into cruel Convulsions of the *Viscera* and *Præcordia*. 2. If the Explosive and Heterogeneous Particles be combined with the spirits in a lesser plenty, they stick to them without tumult or perturbation, until, after some time, both Particles leaping again one from another, and from their striking one another, raise up Convulsive Paroxysms; which sort of Paroxysms are periodical, and are repeated exactly at certain hours; which happens by reason of the Morbifick matters being daily poured upon the Nervous stock, with an equal dimension; and therefore about the same space of time it is also daily heaped up to an explosive plentitude; or they are wandering and uncertain in others, for that the Heterogeneous Particles are poured in with a lesser company, and so arise not to an explosive fulness under a long time; when in the mean time, the more full heaping of them together, and their explosion, are

The Spasmodic matter causes Convulsions, either continued, or periodical, or by fits.

are wont to happen sometimes more often, and sometimes more seldom, by reason of several occasions, or evident causes: hence it comes to pass, that the Spasmodic Distemper is sometimes altogether attributed to the evident cause; when indeed, if a more remote Convulsive cause had not gone before, such a cause had stirr'd up none.

The evident causes of Spasms.

Therefore, that we may say something of the evident causes of Convulsions, we have already observed, if they be more vehement, and happen to a weak and tender constitution of brain and nervous stock, they are sometimes solitary, or of themselves cause Convulsive Passions: but as often as the Spasmodic Distemper is heavier, and being made habitual is wont to return oftener, though the evident cause be manifest, and bears the blame of the effect, nevertheless it is to be suspected that a procatactick, or more remote cause exists, and is the more strong efficient, though it lies hid within: for unless the spirits are imbued with an Heterogeneous *Copula*, they would not be so easily nor so often driven into involuntary and preternatural Explosions.

The Evident Cause twofold viz. Relling and Irritating.

We meet with a double order or *Classes* of Evident causes; for either they are of that sort which increases the procatactick or more remote, and brings it sooner to an explosive fulness, as are an ill manner of living, and errors in the six *non-naturals*, which by infecting the blood, and nervous juice, heap up to a Saturny, in greater plenty, on the Spirits heterogeneous particles, and by that means do the sooner procure Spasmodick accessions. Or 2dly, The evident cause is said to be, whatever stirs and irritates suddenly the spirits, that they presently fall into explosions, and whatever it be, that causes them to strike off their *Copula*, and of this sort there are very many accidents, that provoke the spirits, planted now within the Head, and now within the nervous System, to convulsive motions by a divers instinct (as is wont in the regular motions) which motions are either direct or reflected.

The irritating cause stirs up Spasms, direct, or reflected.

1. Of the former kind chiefly are violent perturbations of the mind, wherewith the spirits of the brain being agitated and confused, they excite others lying within the nervous stock, and often prædisposed to irregular explosions; so a vehement fear, anger, or sadness, do not only introduce epileptical and hysterical fits, to those that are disturbed in their health, but sometimes cause to divers others, palpitation, and trembling of the heart, and also horrid convulsions of the members and limbs. 2. As to the other kind of evident cause, to wit, whereby Spasms are excited by a reflected Act, this indeed comes to pass not unfrequently, as often as any heavy trouble, with an irritation of the *fibres* and spirits, happens any where to the nervous stock: for that this trouble being by and by communicated to the chief fountains of the Spirits, to wit, the brain or Cerebell, from thence inordinate and violent motions, against the will of the mind, that is convulsive, being begun, they are returned back, for so either worms, physick, or sharp humours, cruelly hauling the coats of the Intestines, cause spasms in those parts, and not seldom in the outward members.

So much for the several kinds of causes, the conjunct, procatactick, and evident, whereby convulsive Diseases, becoming habitual, and are wont to be repeated with more grievous Paroxysms, do arise: But as we have assigned another species of this Disease, where the Paroxysms depend on an evident solitary cause, or at most only from irritation, the Spirits being not yet præoccupied with an explosive *Copula*: it is now next to be inquired into, by what and how many ways this may come to pass. Concerning this in general, it is affirmed, that the Spasmodick fits produced by mere irritation, are either lighter and quickly passing away, or more grievous, and not seldom deadly, as when poyson is taken, or when they come upon an overpurging medicine. Moreover it is noted, when the morbidick, or irritative matter falls upon the tales themselves, or the foldings of the Nerves, that it also not rarely becomes explosive; and so Spasms produced also from mere irritation (as we have already noted) are certain explosions; these being thus premised, we will dispatch the business in hand.

The irritating Cause distinguished, as to the places affected, as to the Subjects.

The places affected are the beginnings the extremities, and the middle processes, and foldings of the Nerves.

The irritation of the nervous parts, which is wont to cause convulsive motions, happens in various places, and from various matters, which are incongruous and inimical to the spirits, and *fibres*. As to the things, enemies to the Nature of the spirits, you may observe, besides poysons, and the excess of cangible qualities, which are inflicted from without; many things which are begot within us, viz. the various recrements of the blood, and nervous juice, feverish taints, preternatural salt, or sulphureous humors, yea worms, the stone, with many other things, to be infestous to the nervous stock, and ordinarily to stir up Spasmodick irritations. As to the places affected, or the seat of the irritative matter, although this brings hurt in any part of the nervous System, yet for the most part, it is wont to become most infestous, when it is fixed near the beginnings or the ends of the nervous System, or about the middle processes of the Nerves, and especially in their foldings: Besides, such a matter, which irritating the Spirits, is wont to have the place of an evident cause, doth not seldom become, as we hinted but now.

the means of a more remote cause, forasmuch as the heterogeneous particles, being sent from it, enter into the nervous fibres, and being combined with the Spirits, renders them more apt and ready to be exploded.

1. Therefore, it sometimes happens, that malignant humours, and infectious to the nervous stock, being poured out from the blood, on the region of the brain, and from thence being dilated to the hinder region of the Head, do fall upon the *origins* of the nerves: where, if the little skin, which cloaths the oblong pith, be broken, they fall into the naked trunks of the nerves, and enter deeply into their fibres; wherefore indeed, *Convulsive motions* arise, not only in the neighbouring parts of the head, but sometimes in very remote, and not rarely in the whole Nervous System: This is generally observed in evil Crises of fevers, the morbid matter being translated to the head; also in cephalic Distempers, being brought to the worst and deadly state. Truly when I have opened the heads of those who died by this means, I found in all of them the hinder region of the oblong pith, jimmied with a sharp and salt *Serum*.

How the irritating Cause affects the origins of the Nerves.

2. As the interior extremity, or original of the System, is not rarely the exterior, or the end, from a vellication or hauling there made, begets Spasms or Convulsive motions, and transfers them on every side: that this is done ordinarily in the outward members, the prickings of the Tendons and Nerves do testify. No less are Spasms wont to be excited every way about, from a vellication or pulling made in the *Viscera*, when at any time Medicines, or sharp humors, also Worms lying in the Ventricle or Intestines, pull the membranous part, and so impress a troublesome sense on the chief sensories; presently from thence, by reason of the firing of the spirits, *Convulsive motions* torment now the affected parts, and now indifferently any other parts; for oftentimes Spasms, from the more grievous hurt of some inwards, do not only employ the affected parts, and their neighbours, but also the Muscles of the Face and Mouth, and are likewise transfer'd to the exterior members. The Stone impacted in the Ureters, causes not only cruel contractions in that passage, but in all its neighbourhood. Moreover, some Hysterick and other Hypochondriack symptoms, are sometimes induced by this means; forasmuch as by a vellication made in the Membranes of some *Viscera*, thence the Spasm is returned back.

How the extremities of the Nerves.

3. The irritative matter, which is wont to be the evident cause of Spasms, sometimes occupies the middle processes of the Nerves, and therefore the parts, sometimes above, sometimes beneath its seat, are incited to Convulsive motions: This appears plain enough in the foldings of the Nerves; for when the sharp recrements of the Nervous juice, are laid up in them, they do not rarely create Spasms, through the whole neighbourhood: by this means the Collick or Hysterick Distemper, is often seen to be begot or excited, there being no fault in those inwards, only from the humors deposited in the foldings of the mesenterie, as we will shew hereafter, when we come to treat of those particular Distempers. In like manner, by reason that the ganglioform foldings being stopped up with a sharp and irritative humor, perfocation or choaking in the Throat, and various contractions of the *Præcordia* are caused. Besides, Spasmodick Distempers do not seldom depend upon a sharp humor within the whole trunks of the Nerves, and filling the passages of the Nervous Bodies. We have seen some troubled with admirable and perpetual Convulsions, so that they have been forced (as we have already mentioned) to run about, to leap, to fling about, and distort their members, to strike the ground with their feet and hands, and to exercise other strange gestures, even as if they had been bewitch'd; the genuine cause of which kind of passion, seems to consist in this, that the juice watering the Nervous stock, being most sharp, like stygian water, and being become degenerate from its due *Crafsis*, doth irritate continually, and as it were possess with a certain madness, the spirits therein flowing and implanted.

How the middle processes and foldings.

From these things which we have discoursed about the various causes of Convulsions, their manifold *Species* and differences are made manifest. For first, we have made known, that Spasmodick Passions are most often derived in respect of their *origine*; for the head, being affected; or the Morbid matter flowing into the beginnings of the Nerves: yet sometimes, though more rarely, they depend upon such a matter creeping into the extremities of the Nerves.

The difference of Spasms in respect of their origine.

2. As to the production of the Disease and Symptoms, we observe the same sometimes to be produced from a solitary evident cause, as a sudden and vehement Passion: but indeed more often to require a more remote, or procatartick cause, or previous disposition: moreover, the causes sometimes so to interfere, that the procatartick also may supply the place of the evident cause; and also on the contrary, that this may serve in the place of the other.

Of their causes.

3. As to the extension of the Disease, the Convulsive Distemper may be distinguished into *Universal*, because the spirits actuating the whole nervous System almost, and the *Encephalon* it self, are successively exploded; and *particular*, in which the spirits within some private region of the animal Kingdom are disturbed.

Of the extent
of the Disease.

1. The former is meant when the animal spirits are irritated within their first fountains, to wit, the pith of the brain and cerebel, from whence their violent explosions happen; wherefore every internal function of the Soul, to wit, the sense and imagination, is obscured, and its exterior locomotive faculty perverted: This kind of universal Spasmodic Distemper, in which, besides the Spasms of the Limbs and *Viscera*, the interior powers of the Soul suffer an Eclipse, is again twofold, to wit, either *primarie*, which begins at the Head, and arises; forasmuch as the spirits inhabiting that place, being imbued with nitro-sulphureous Particles, are first exploded, and there inkindling, snatches or takes hold of the rest, flowing in both the medulary and nervous *appendix*, and there stirs up Convulsive explosions, as may be discerned in the Epilepsie.

2. Or this universal Passion, causing insensibility, is secondary, to wit, which being begun somewhere in the nervous stock; from thence plenty of spirits being successively affected, becoming like the undulation or moving of waters, is at length carried to the head it self: this often happens in Paroxysms called *Hysterical*, in which, by reason of the Spasm begun at first in the bottom of the belly, or some intumescency or rising up in the *Abdomen*, then the same spreading higher, with the same effect, through the pipes of the Nerves, the Ventricle, and by and by the *Præcordia*, are drawn together; and at length the Spasm forceably rushing to the Head, the Patients fall down, and all Knowledg is taken from them; and lastly, the Disease being reflected into other Nerves, Convulsive motions of the exterior members succeed.

2. But as to the particular Spasm, in whose fit the sick continue well in mind, this indeed is distinguished into various differences. As to the seat of the matter, which happens about the beginnings, extremities, or middle processes of the Nerves (as we have shewn) there arises a difference: For even as this Morbifick matter, besieging the beginnings of the Nerves, is fixed about the head, middle, or end of the oblong pith, it therefore happeneth that sometimes only the parts of the face, or mouth, sometimes the *Viscera* of the lower or middle belly; and again, sometimes chiefly the outward limbs are hauled together.

Of the duration
of the Fit.

Further, a Convulsion, as to the duration of the fit, and its magnitude, uses to be distinguished into a continual and intermitting: The former, as we have already hinted, is called *Tenasmus*, or a permanent contraction; as when one part, or more, being contracted or distorted with a constant stretching, are detained for some time in the same preternatural posture; so when the Muscles, or a Member, suppose the Eye, Lips, Cheeks, are distorted from their right position, nor cannot easily be presently reduced: the cause of which is sometimes a resolution, or Palsie in some other Muscles, which when they are loosened, the opposite do too strongly act, and draw forcibly the whole part towards themselves, which ought to stand as it were betwixt them, in an equal ballance: but sometimes such a permanent contraction is excited, by reason of the Tendons being stopped with an impacted serous humor which become for that cause stiff: this kind of Distemper becomes very familiar in the Scurvey, that the sick sometimes are not able to extend any Member or Joynt, but they are contracted round like a Globe. Sometimes the Tendons in the back, by reason of such a course of humor, draw the bones out of their due situation, and cause a gibbousness, or bending out of the Body. The *Tenasmus* is wont to be distinguished into universal; of which there are three kinds, to wit, *Tension* forward, *Tension* backwards, and *Tenasmus* properly so called; and peculiar or particular, which chiefly respects some certain Member or joynt: we will speak of these distinctly hereafter.

2. The intermitting Convulsion is either short and momentary, which is acted by frequent turns, and as it were by little leaps, as is to be observed in the quaking and shaking of the Tendons in horror, which are to be distinguished between with a frequent alternation of motion and rest: or the leapings of the Spasms, and their intervals, are drawn out longer: so it is usual for Convulsive Paroxysms, when they are repeated, to endure for some time, and to leave off again; but such periods are now certain, or come to certain set hours, now rare and incertain, and happen after a divers manner, and as various occasions are given. There are other differences of this Distemper, which will be better illustrated hereafter, when we shall speak particularly of each kind of Convulsions.

CHAPTER II.

Of the Epilepsie.

Thus far we have treated of the nature, causes, and differences of Spasms or Convulsions in general, according to a clean, new, and unusual *Hypothesis*; but (as I think) agreeable enough with Reason: our next business is, to explain particularly the chief kinds of that Distemper; amongst which the *Epilepsie* easily deserves the pre-eminence, and the consideration of it ought to proceed by a certain right of method and order; for that this Disease having as it were got a large Empire in the human body, exercises its Tyranny not only in the whole *Encephalon*, but for the most part in all the parts of the Nervous System at once: wherefore by the Ancients it was called *Morbus Herculeus*, or the *Herculean Disease*, from the cruelty of the Distemper, and from the manner of the violent fits, as if sent as it were by some Divinity, being so amazing; *Morbus Sacer*, or the Holy Disease; to which may be added, the conjecture of a certain Divine of our own Country, of no small note, *to wit*, that many who were taken to be *Dæmoniacs*, or possessed with the Devil in the *New Testament*, were only Epilepticks; and that they called the cure of this Disease by our Saviour Jesus Christ, an ejection or exorcism of the evil spirit: In truth, in this Distemper, no marks at all of the Morbifick matter appears, or are so very obscure, that we may have deservedly suspected it to be an inspiration of an evil spirit; at least it is probably, that as often as the Devil is permitted to afflict miserable Mortals with his delusions, he is not able to draw more cruel Arrows from any other Quiver, or to shew Miracles by any better Witch than by the assaults of this monstrous Disease.

As the symptoms of the *Epilepsie* are very stupendious, so their causes, and the formal reason of the Disease it self, are most difficult to be unfolded. For indeed, the business is variously controverted among Authors, both concerning the part affected, and also the manner of its being affected: many place its seat in the Brain, or its Ventricles; others in the meninges, or thin skins enwrapping the brain; and some again in the middle, or lowest belly; but by what right shall be inquired into anon: In the mean time, laying aside the Opinions of others, that the true speculation of this Disease may be found out by the clew of right reasoning, we will first of all endeavour to give you its description, together with the whole sense of its *Phænomenas*. Secondly, these things being rightly weighed, to find out the subject of the Disease, and its chiefly affected parts. Thirdly and lastly, To add the means and manner whereby this Disease is begotten, with the true causes of its symptoms.

In the first place, As to the Idea of the Disease, the Epileptick fit or assault seems to be only an universal and more cruel Convulsion, to wit, in which the spirits inhabiting the Brain, being first irregularly moved, and as it were confused, all the rest dwelling in both the medulary and nervous appendix of the *Encephalon*, begin at once Convulsive motions, or inordinate contractions, and continue them for some space, with frequent leapings or palpitations: The accession of the Disease comes upon them at unawares, and oppresses the sick, not the least thinking of it; and in the twink of an Eye casts them on the ground, deprived of sense and understanding; for that they do not only fall, but are flung down with a certain force, so that oft-times the part first stricken against the Earth, or other adjacent bodies, is hurt with a bruise or wound; being last done, there comes upon them a gnashing of Teeth, with a foam at the Mouth also, oftentimes the shaking of the Head, and a frequent knocking it against the ground, the Arms and Thighs, yea, the hinder part of the Neck and Back either become presently flit, or else they are distorted hither and thither, with various bendings; some cruelly beat their Breasts; others strongly thrust out their Arms and Thighs, and fling them, and sometimes the whole Body, impetuously here and there; many have their *Præcordia* and *Hypochondria*, and also all their lower Belly swelled and blown up very much: after some time, sometimes shorter, sometimes longer, these symptoms, the Tragedy being as it were acted, cease on a sudden, and then the sick come to themselves, and recover their senses: but after the fit there remains an aking in the Head, with a dulness and hebitude of the senses, and not seldom a turning or giddiness.

The description of the Epilepsie, or the history of the Disease.

The *Epileptick Paroxisms* are wont to return sometimes at set times of the day, month, or year; and most commonly at the greater returns of the Year or Tropicks, or at the opposite aspects, or conjunctions of the Sun, or Moon, they are wont more certainly to return, and to afflict more grievously: sometimes their comings or accessions are uncertain, and wandring according to the occasion and variety of evident causes: there are also Fits or Paroxisms, now more light, which quickly pass away, so that the sick are scarce thrown to the ground, nor are carried into disorder or insensibility; now more grievous, whereby they when taken lie senseless the space of an hour or more, and are tormented with horrid symptoms, as if possessed with the Devil: Sometimes tho more rarely, some foregoing signs of the Fit, warn them of their falling into it; as an heaviness of the Head, a brightness of the Eyes, a tingling of the Ears: sometimes a Spasm or Cramp proceeds in some exterior part, as in the Arm, or Thigh, or else in the Back, or *Hypochondria*, which ascending from thence like a cold Air, and creeping towards the Head, seems to bring on their falling down. Boys and young Men are found to be more obnoxious to this Disease than old Men, or Men of mature age: who ever are once struck down by its fit, unless they be cured by the help of Medicines, they will hardly be altogether free from the infection of it all their Life after; the more often the Fits are, the more grievous they become; which as they frequently return, become more cruel, and enervate the use of the memory, imagination, and reason, and then the strength and force of the whole animal function, until its Oeconomy being greatly perverted, the vital function at length decays, and by degrees is abolished. The weapons and wicked preparation of this Disease, being after this manner laid open, we will next make an inquiry in what part it fixes its seat, or what is its next subject.

The subject or the seat of the Disease is inquired into.

The accession of the Epilepsie, and the manner of invasion, seem plainly to declare, that its primary seat, or part chiefly affected, is contained somewhere within the Head; but that a Paroxysm sometimes begins in the remote parts, and from thence ascends towards the Head, which indeed seems only to be so, and happens by accident, when in the mean time the Morbifick cause subsists about the *Encephalon* it self, (as shall be anon declared:) but that from the first assault of the Disease, presently a strange insensibility and disorder, with contractions almost of all the Members and *Viscera* succeeds, it is a manifest sign that the whole joynting of the *Encephalon*, and the original of all the Nerves, are possessed with the Morbifick cause: But truly, although it seem most difficult to unfold where this cause or morbifick matter subsists chiefly; for, neither is it probable that the same is diffused thorow all the parts of the Brain, yet it neither appears in what singular place this being fixed should draw all the other parts so suddenly into a consent of its evil.

Some affirm it the meninges or thin skins of the Brain; other the pith or middle part of the Brain.

Among the various opinions of Authors about this matter, there are two that seem more probable than the rest, and challenge an assent with an equal likeliness to Truth. One of which asserts the very middle of the brain; and the other the meninges, or the thin skins encompassing or cloathing it, to be the primary seat of the Epilepsie: The reason of the former is founded in this, that where the fountain of the animal spirits, and the original of the sensitive soul it self consists, there ought to be placed the cause of this Disease; certainly when the chief faculties are first hurt, all the rest easily participate of the same evil: But in truth, though I may grant in the Apoplexy, and the *deliquium* or fainting of the spirits, that it is so, yet it follows not in a Convulsion (of which kind of Distemper the Epilepsie is) that all the *Fibres* and Nerves should be pulled together, because the middle part of the brain is first pulled: for that this, as it is a moist and fluid substance, and wanting of sense and motion, seems not capable of contraction, or the Spasmodic Distemper: wherefore others thinking the brain and every part of it, free from the blame of this Disease, cast it altogether on the meninges: affirming, that the membranes, cloathing the brain, and chiefly their processes, spread upon the clefts of the brain, and *Ceribel*, as they are hauled by the morbifick matter, do conceive or beget Spasms or horrid Convulsions, and then that from the Meninges themselves so contracted and brought together, the included brain is greatly compressed and bound together, so that its pores and passages being bound up, the great amazing disorder and insensibility is induced, and also the trunks of the Nerves, to which either meninge or skin is fastened, being brought into a consent with them, enter also into Convulsive motions: And indeed after this manner the formal reason of the Epilepsie may perhaps seem to be unfolded; but truly when I consider further of the matter, I think we may differ from this opinion, because it does not appear by what course, or for what cause, the falling down being at hand, these meninges should beget such horrid Spasms. Nay, it neither appears, how from them, however Convulsive they be, the Epileptick Paroxysm should be induced.

As to the former, it seems an impossible thing, for the meninges to be so contracted, as to their whole Concavities, that being bound more strictly together, like a purse, they should on every side pull together their contents, and draw them into a narrower space: for that the *Dura Mater* sticks most firmly to very many places of the skull, yea, and the *Pia Mater* is tied to it, near the processes of the hollow turnings, by a mutual knitting of the membranes, and every where besides with a continuity of Vessels: hence it easily appears, either that membrane, as to the greatest part of it, is immovable, so that they cannot fall into so universal Spasms: but in respect of lesser Spasms, as when a certain portion of this or that meninge, or both together, is pulled, indeed we grant such may happen: for I have often heard those troubled with great headach to complain extremely of a great constriction of the parts, lying under the side of the skull; sometimes on the right, sometimes on the left, and yet from thence no assault of falling down has followed: Further as those membranes being notably hurt, do cause great velleications or haulings, yet upon it there is not wont to be an Epileptick fit to follow: for I have known, from an Imposthume in the *Dura Mater*, when being broken and that the stinking matter had knawn the more tender meninges, and shell of the Brain, that the sick hath fallen into an amazedness, and at length into a deadly Apoplexy, who notwithstanding in the whole course of the Disease, was free from any Epileptical Symptom. Also I remember, I have seen one, who had the *Dura Mater* very much torn by the Instrument of an unskilful Surgion, and another that by a wound, had that with part of his skull taken away, so that a portion of the brain swelled forth, and yet to neither of them any Epileptical passion hapned; wherefore neither is it likely that the blood or humours, or (if any shall so argue) the vapours, compacted within those meninges, can bring in any greater evil than either a stroke or wound inflicted on them, or filthy matter there poured out: Besides, those who are more lightly troubled with the Epilepsie, so that they scarce fall down, and have their minds free through the whole assault of the disease, would perceive the membranes to be so contracted, and the globe of the brain to be more straitly thrust together, if there had bin any such kind of affection; but they on the contrary seem to have the brain as it were inflamed, and to be sensible, that the spirits leap forth, and are as it were exposed, with a certain fierceness.

It is affirmed, that the meninges are not first of all affected.

The spirits inhabiting the middle of the brain are the primary Subject of the disease.

As indeed, I think it is very likely so, that the Epileptick Paroxysm is stirred up from a certain sudden rarefaction, and explosion of the animal spirits, inhabiting the brain, which are in truth the first and immediate subject of this Disease; to wit, whereby the Brain it self is inflated, and rendred so insensible, and the nerves hanging thereto, also put into Convulsions: For hence it comes to pass that the accession of this Disease begins so on a sudden, and determines perfectly without any great provision or remains of the morbidick matter; because the Infection is not brought so much to the solid parts, as to the spirits themselves.

We have already shown by what means, the heterogeneous and explosive *Copula*, consisting as it seems of *nitro sulphureous* particles, cleaving to the spirituous particles of the animal Spirits, and lastly, being smitten and exploded by them by reason of plenitude or irritation produces Convulsive Symptoms: But altho this kind of Spasmodick *Copula*, is first distilled from the blood into the brain, yet for the most part it does not take hold of the spirits there, or at least it stays not long with them in that place: but rather being thrust from thence towards the nervous *Appendix*, causes particular and respective Spasms, near the places affected: But sometimes if the spasmodick matter be more plentiful and strong, and the constitution of the brain weak, the heterogeneous *Copula*, being fixed to the Spirits, not only in the nervous stock, but also to those planted within the *Encephalon* it self causes the epileptick disposition; and the explosive particles of the Spirits, and this *Copula* knocking one against another, stir up the falling fit. For indeed, since the assault of the Epilepsie urging the insensibility, and great disorder, is for the most part the first Symptom, and all the pathognomick, it may be concluded that the Animal Spirits lying within the middle of the Brain it self, are affected before others; and that therefore that part is the principal seat of the disease: Then, so far as the falling of the sick, or casting to the ground, and spasms of the members and *Viscera* most often follow that Insensibility great disorder, or leaping forth of the spirits, it follows that the animal Spirits also inhabiting the Nervous System, are imbrued with the same explosive *Copula*, and are drawn into consent with those inhabiting the brain it self, and are excited by them, to explosions purely inordinate; altho sometimes (by the whole series of Spirits, planted both in the brain and nervous stock, being like a long train of gunpowder, predisposed to explosions) an exterior Spasm, beginning a great way off, perhaps in some member or inward, may afterwards be carried to the Brain, as shall be more fully shown hereafter. In the mean time, it is concluded, that the region of the Brain it self is always the primary seat of this

this disease; and that we ought to suppose the conjunct cause of the distemper, not to be water heaped up within the ventricles of the brain, nor a thick or clammy humour, impacted in the passages of its pores: for such causes are begotten by degrees, and therefore would shew some certain signs before-hand, of the first coming upon one: further, the assault of the fit being over, such a matter could not be wholly discussed in so short a time, but that from its reliques some impediments of the animal function would remain, which indeed rarely happens in the Epilepsie unless inveterate: but, for the exciting of the falling down, no less can be imagined, than that the animal Spirits which flowing within the marrowie substance of the brain, perform the acts of the interior sense of the imagination and appetite, having got an heterogeneous *Copula*, should be inordinately exploded, and so they being disturbed beyond their orders and stations, the superior faculties of the animal regimen, must suffer an eclipse; then, from this greater explosion of Spirits as it were from a fiery enkindling, other Spirits inhabiting the marrowy and nervous appendix, being also prædisposed to explosions, conceive the like disorder, and in like manner cause the explosive convulsive motions of the containing bodies.

The disease affects secondarily very many parts of the Nervous System.

For altho we conclude, that the middle of the brain is always the primary seat of the Epilepsie, and that from the beginning, the morbid matter is laid up wholly in that Region; yet the distemper growing grievous, this being more plentifully spread thorow the head, enlarges its bounds, so that it being strowed here and there, and far and near stretched out, Spasmodick particles are cast into the rest of the Brain, and also into the nervous appendix like gunpowder or explosive seed, whereby it comes to pass, that at the first approach of that disorder of spirits, convulsions follow sometimes in these, sometimes in those parts, and not rarely thorow the whole body.

CHAPTER III.

The Differences of the Epilepsie, and the reasons of some of the Symptoms are unfolded. Also its Curatory Method is represented.

THUS far of the essence and the causes in general of the Epilepsie; it shall be now our next task to explicate the differences of this Disease, also the reasons of some of the accidents and Symptoms belonging to it; to which we will lastly add, Observations and Histories of sick people, with the method of curing.

The Reason of the Epilepsie which is said to be excited by consent.

The most notable difference of the Epilepsie, is wont to be taken from the Subject, to wit, that the brain or part of it, labouring with this disease, is either primarily, and idioopathetically or properly affected, or secondarily and not but by a consent with other parts: concerning the former kind, we have hitherto discoursed as to the other, to wit, in which the falling down seems to arise from some place without the head, and then lays hold of it secondarily, and as it were by a blast sent from elsewhere; it is to be observed, that this kind of distemper (as *Galen* hath noted) proceeds either from the external or internal parts: we meet with many examples of Epilepticks, in whom the fit being just coming upon them, a spasm is felt with a numbness in the hand or toe, or other particular member, which presently from thence as it were with a pricking or tingling, creeps towards the head, which when it hath attained, immediately the sick party falls flat on the earth, and is hurried into insensibility and disorder of Spirits, and other proper demonstrations of the Symptome of the falling-sickness; neither is it a less usual *proæmium* of this disease, that there first arises as it were a conflict in the stomach, spleen, womb, intestines, genitals or other inwards: or that some kind of perturbation is raised in some of them; then from that place, the ascent of (as it were) a cold air is perceived, to which distemper follows the accession of the falling evil, with its most horrid provision of symptoms: hence it was commonly believed that the cause of the Epilepsie lay hid in the part, seen to be so primarily affected, and propagated its evil to the brain, of its self innocent.

But in very deed, as to this we must say, that in every Epilepsie not only the procurent or remoter Cause, but also the conjunct remains wholly in the brain: to wit, that the spirits inhabiting it, being disposed to explosions, and there being exploded, bring on or

cause every falling evil. As to those præliminary Symptoms in some epilectical people, they sometimes have the place of an evident cause, and sometimes only of a sign: For when the evil disposition of any inward, as the stomach, spleen or womb, happens with the disposition of the Epilepsie, as often as any perturbation is begun in that distempered inward, it easily happens by reason of a transmission of the ferment from thence, or a continuation of the spasm to the head, an Epileptical fit is excited in the brain prædisposed to act.

But these kind of symptoms of the falling evil, which being suscitared from without seem to propagate the distemper to the brain, do often arise from the consent of the brain itself, and are only signs of the approach of the epileptical Fit, or of the spirits beginning to be exploded in the brain: For when the animal spirits planted in the middle parts of the brain and Cerebel, and also those in the oblong pith or marrow, near the beginnings of the Nerves are so filled with an heterogeneous *Copula*, that for the casting it off, they are ready to bring on the assault of the disease, before they are all exploded heap by heap, some spirits lying more outward in some private Nerves, because they are destitute of the wonted influx of their superiors, fall into certain inordinations, and so begin spasms, which spasms (as it is often the manner in this kind of distemper) begin at the extremities or ends of the Nerves inserted to this or that member or inward; from whence by degrees they creep forward to their beginnings; whither being come forth with the spirits thorow the whole *Encephalon* before disposed to explosions, being moved by that spasms, and so being snatched away with a fiery enkindling, are suddenly exploded or thrust out; so they seem to stir up the Epileptick Fit, beginning at first from themselves as it were secondarily and by instinct, brought from some other place: After this manner, sometimes the Histerical passions, when beginning in the bottom of the belly, they are communicated to the brain, are thought to arise from those Viscera, and to be stirred up by their fault; when in the mean time, the morbid cause subsists chiefly about the beginnings of the Nerves, as we have elsewhere signified, and shall again show hereafter, when we come to treat particularly of the Spasmodick distempers.

There yet remain other differences of the falling sickness, to wit, that it is either hæreditary or acquired; again, either kind is variously distinguished by reason of the Age or time, in which it first comes upon one, to wit, when the first coming of it happens before, or about the puberty or being of ripe age or after it; further as to the Efficacy of the disease into strong and weak, for as much as the Paroxysms or Fits are with, or without the disorder of spirits, and falling as to its inordinate manner, whose assaults are wandering and uncertain, moreover it is wont to be distinguished according to the peculiar Symptoms in these or those sick people, by reason of some disposition, or manifold Idiosyncrasy, or propriety of the Temperament.

Other differences of the Epilepsie.

But from what has been said before of very many of the symptoms, which are to be met with in this disease, the causes do easily appear, so that there will be no need here to consider all of them: but of some of them, which seem more intrinsecate, it will not be from the matter to discourse in this place.

We will therefore first of all inquire, why those sick of this disease, do not fall as those that are apoplectick, or have swoounding fits, but are rather stricken down with violence against the Earth or any other bodies, that are by chance opposite to them, as if they were smitten down by some wicked Spirit, so that very often some part of the head, or face is hurt with the violent fall: And those so distempered, even like the Dæmoniaicks in the Gospel, are frequently flung into the fire, or the water; but it may be here declared, that the Epilepticks become obnoxious to these kind of evils, for that the fit coming upon them, all knowledg or providence is taken from them; and further, the nerves neighbouring to the head, being strongly contracted, the whole bulk of the body is carried away headlong: but in the Syncope and Apoplexie, the fall of the distempered body, seems as the ruines of a building, which happens by reason that its Props are taken away: but indeed in the falling Sickness, it is no otherwise than if a house were overthrown by the blowing up of gunpowder, which is removed much from the place where it stood.

Why Epilepticks fall down with violence.

Secondly, It is commonly esteemed a great Pathognomick, or Peculiar Symptom of the Epilepsie, if when the diseased being fallen to the earth, and suffering most horrid Convulsions, there flows from the mouth, a spumous spittle or foam, which indeed is thought to be pressed from the brain, being strongly contracted into the Palate: But in truth, though it be granted that this flux of spume be very often a sign of the falling Sickness, yet it is not so appropriated to this disease, but that the same sometimes happens in the Apoplexie, in deep sleep, in hysterical distempers, and other convulsive diseases: Besides this kind of foam, does not descend from the Brain, for there is no passage open

From whence the Foam at the mouth of these troubled with the falling sickness comes.

open, by which it may pass, but from the Lungs being inflated and elevated even to the Larynx, or the top of the sharp Arterie, from whence spittle foams forth, with a certain fervency and ebullition: For the fit of the falling evil growing urgent, when most of the Nerves in the whole Body are drawn together, those also, that serve for the motions of the Lungs and Diaphragma, suffer most cruel Convulsions, and lifting up all the *Præcordia* upwards, continue them almost immovable, in a long Systole, so that the breathing, and pulse, cannot be at all perceived; In the mean time, because the blood straitned within the bosom of the heart distends it, and also almost choaks it, the Lungs however hindered that they cannot be moved after their wonted and natural manner, perform what they can, with a thick and hasty agitation, whereby the blood may be drawn forth from the Heart; by which endeavour of theirs, the shaking air, by the frequent or thick respiration, raises the viscous or clammy humidity into froth, like the shaking of the white of an Egg; by and by it lifts it upwards towards the cavity of the mouth, and so at last drives it out of doors: wherefore a foam or spumous spittle does often succeed in other Distempers, where the pneumonic or breathing Nerves are either contracted, or are hindered from performing their Function.

Why some in the falling knock their Breasts.

Thirdly, Moreover, from the same reason it comes to pass, that some Epilepticks being fallen to the ground, beat most grievously their Breasts with their Hands, and are hardly to be held from it: for when the *Præcordia* being troubled with the Spasm, and hindered that they cannot move themselves after their wonted manner, and the blood stagnating in them, not without a great oppression of the heart, threatens a suffocation of Life; then it is that the sick strikes their Breast, to wit, that the *Præcordia* so shaken, and as it were moved up and down, might renew their motions, and so the blood might be relieved from its stagnation, and the heart from its heavy oppression: and this is done after the same manner, as when some that are sleeping being tickled, or bit by a flea, unknown to themselves, presently rub, or scratch the affected place.

The prognostication of the Disease.

As to the Prognostication of the Disease, we have already declared, that it is of very difficult cure, which difficulty consists in this, that the middle of the Brain (in which is the chief spring and fountain of the animal spirits) is very much debilitated, not only by the Morbifick cause, but also by its effects, to wit, the several fits; and its pores loosened, so that they lie open for the entrance of every Heterogeneous matter: and so the Morbid disposition it self being confirmed by the repeated Paroxysms, and taking deeper root, it is hardly taken away. But it is to be observed, that the Epilepsie sometimes terminates of it self, and is sometimes overcome by the help of Medicines: which happens about the age of puberty, and then only; so that who are not cured, that time being elapsed, that is before the twenty fifth year of age, they scarce ever after recover their health; for about the time of ripe age there is a twofold alteration of the humane Body, and therefore there often happens a solution or loosening of the Falling sickness, or of any other Disease deeply rooted: For first, at that time, the genital humor begins to be heaped together in the spermatick Vessels, from whence it follows, that the spiritious Particles, and what are wont to grow to them, nitro-sulphureous and Morbifick Particles are laid up, not only in the brain, but also in the testicles: wherefore if this Heterogeneous *Copula* of the spirits be more plentifully carried to that new store-house, from thence the brain becoming free, often leaves the Epileptical or otherways Morbid disposition. 2. About the time of ripe age, as the Blood pours forth something before destined for the brain through the spermatick Arteries to the genitals, so also it receives as a recompence, a certain ferment from those parts through the Veins, to wit, certain Particles imbued with a seminal tincture, are carried back into the bloody mass, which makes it vigorous, and inspire into it a new and lively virtue; wherefore at that time the gifts both of the Body and Mind chiefly shew themselves; Hairs break out, the Voice becomes greater, the Courses of Women flow, and other accidents happen, whereby it is plain, that both the Blood and Nervous Juice, are impregnated with a certain fresh ferment: wherefore the Morbifick ferments or seeds, unless they be overcome by this new natural ferment, they afterwards continue untameable even to death.

But that the Epilepsie is sometimes cured by the help of Medicines, experience doth testify: we shall anon Discourse of the method of healing, and shew the reasons of the most famous Medicines; in the mean time, as to what further belongs to the prognostication of this Disease, if it end not about the time of ripe age, neither can be driven away by the use of Medicines, there happens yet a divers event in several sick Patients, for it either ends immediately in Death, or is changed into some other Disease, to wit, the Palsie, Stupidity, or Melancholy, for the most part incurable.

The Epilepsie is changed into other Diseases.

As to the former, when as the fits are often repeated, and every time grow more cruel, the animal function is quickly debilitated: and from thence, by the taint, by degrees brought on the Spirits, and the Nerves serving, the Præcordia the vital function is by little and little enervated, till at length the whole body languishing, and the pulse being loosned, and at length ceasing, at last the vital flame is extinguished.

But that this Disease often ends in the palse, melancholly, or madnefs, the reason is, because the tone, and confirmation of the brain is depraved by the often explosions of the animal Spirits, and at length its natural state is so perverted, that by the morbidick particles of another kind also admitted, the spirits are fixed, nor are any more exactly prone to explosions, but rather sometimes by a contrary vice introduced, their Elastick virtue is too much wanting, so that they become dull and sluggish beyond measure; even, as oftentimes the intemperature of the blood, being more cold than it should be, admits the more intense burning of a fever: and indeed, these depressions of the spirit happens partly by their own proper fault; for that their more agil particles being too much exploded, the more dull or heavy, are only left, and from them they are supplied; but partly, as we have said, they happen from the fault of the brain; for that its pores and passages, are so dilated and opened, from the often paroxysms of this falling evil, that afterwards, there is an open passage made, for any heterogeneous, and divers kinds of morbidick particles, to enter with the Nervous juice.

Thus much for the Diagnosis and Prognosis, the description and judgment of the Epilepsie, or falling sicknefs; in the unfolding of which, it was necessary to bring reasons not altogether abstruse and different from the common Pathology, neither are we constrained to recede in the Therapeutick or Curatory part of this Disease from the common and usual method of curing in other distempers: But in truth, the prescriptions of such who follow the ordinarily received Opinions, by which, for the most part, they endeavour to carry away, and wholly to eradicate the morbidick matter, by Catharticks only, do little or nothing avail in the falling sicknefs, yea they are wont frequently to be hurtful to it. I have known some famous Practitioners, omitting wholly the series of the Curatory intentions, betake themselves to certain Emperical Remedies, without the foresight of the whole; this kind of practise, though sometimes it succeeds happily, would much more certainly perform the proposed cure, if the body being rightly prepared, they should in like manner take away all Impediments, by other medicines.

Of the Curatory part of the Epilepsie.

Wherefore, the Indications concerning the cure of the Falling Sicknefs, shall be (as they are commonly set down) either curatory, which have respect to the Fit, and drive it away either coming on, or when upon them, to set it going the sooner: or prophylactick or preventory, which have respect to the Cause of the Disease, which if they can take away, its accessions will be inhibited afterwards.

A general evacuation has scarce any place in the former Intention; for in the fit, neither a Vomit, or Purge, and very rarely the opening a vein, are wont to be administred; if the amazed insensibility and disorder continues very long, sometimes a Clyster is wont to be used, but what that chiefly aims at is, to fix the too fierce and volatile animal Spirits, and also to suppress their begun explosions: For which ends, two kind of Remedies chiefly are made use of; to wit, First, such as repress the animal spirits, being too apt to grow fierce and to leap forth, and repel them with some perfume that is ingrateful to them, and compel them into order: which thing indeed medicines imbued with a volatile, or armoniack salt, or also with a vitriolic sulphur do effect, of which kind are salt and oyl of Amber, Spirits of Blood, Harts-horn, Sut, tincture of Castor, and such like: for these being inwardly taken, or put to the nose, oftentimes bring help, and the evil spirits of this Disease are thought to be driven away, even as in *Tobit*, the Devil was by the stume of the gall of a fish. Secondly, the animal spirits are called away, or hindered from their begun explosions, when they are allured, or held busied in some work they are accustomed to: wherefore, the fit urging, frictions being used, and for some time continued thorow the whole body do often help: but some that set upright the diseased, and altogether hold or restrain their arms and legs, from their convulsive motion, or hold them violently in this or that posture; that also blow things into their noses to make them sneeze, and pour down strong Cordials at the mouth, and apply either Cupping-glasses, and Scarrifications, and handle more sharply with other manner of administrations those sick people, and disturb the manner of the fit, I say this kind of practise is most often too roughly instituted or ordained: because after this manner there is a double trouble put upon nature, to wit, one from the disease, and the other not lighter from the standers by, and helpers, when it were much better, for the fit to be suffered to pass over after its own manner, and the sick to endure but one trouble only.

Truly the chiefest care of a Physician, and efficacy of Medicines is used about the prevention of this Disease, that the cause being taken away, or its root cut off, all the fruits might wither; Medicines requisite to this indication, respect many intentions, which may yet be reduced to those two chief heads; to wit, in the first place, that the enkindling or matter of the Disease being supplied immediately from the vicious blood, or nervous juice, and mediately from the Viscera and first passages be cut off; then in the second place, that the evil disposition of the brain, and the spirits its inhabitants, which is peculiar to the Epilepsie, be taken away.

As to the first indication here, Vomits, Purges, and other things, both evacuating, and altering, yea Phlebotomy, and Cauteries have place; forasmuch as by these means and ways the impurities both of the viscera and humors are subdued or brought away, and their dyscrasie or evil disposition amended: for although these kind of Medicines, and Medical administrations, rarely or never cure the Epilepsie by themselves; yet those take away impediments, set nature upright, and incite her to encounter her enemy; also, they prepare the way, that so specific Remedies might more certainly and efficaciously shew their virtues; wherefore, usually, whilst they take care to cure this Disease, with secrets and hidden mysteries, they make use of those kind of Medicines between whiles, in the Spring, and Autumn, and other fit times.

Secondly, As to specific Remedies, which indeed only, though not always, are able to reach the Epilepsie and to subdue it; of which sort are the *Male Pæony*, *Mistletoe*, *Rue*, *Castor*, the *Claws* of an *Elk*, preparations of a dead mans *Skull*, *Amber*, *Coral*, with many others. Forasmuch as these are taken without any sensible evacuation, or also perturbation following in the viscera or humors, it is a wonder by what formal reason, or virtue of acting, they are wont at any time to help in this Disease.

In what the
Virtue of the
Specifics con-
sists in the
Epilepsie.

Concerning this matter, intricate and obscure enough, if there may be place for conjecture, when as we have already asserted the procatartick cause of the Epilepsie, to consist in the Heterogeneous *Copula*, joyning or cleaving to the spirits inhabiting the Brain, and inciting them to preternatural explosions; it follows, that those things which take away, or resist such a cause, must be of that nature, that by strengthening the brain, and binding up its pores, may exclude that *Copula*, and so fix, and as it were bind the spirits, flowing within the middle or marrow of the brain, from leaving their *Copula*, that they shall not be any more apt or prone to irregular explosions; perhaps after the same manner, as when Gun-powder or Aurum-fulminans being pounded with Sulphur, or sprinkled with spirit of Vitriol, loses its thundering virtue. And indeed, these kind of properties, to wit, one or both of them may be suspected, yea, in a manner detected, in most anti-Epileptick Remedies: For truly, *Pæony*, *Mistletoe*, *Rue*, the *Lilie* of the *Vally*, with many others, abound in a certain manifest attraction, that 'tis likely, their Particles being taken inwardly, and so dilated to the brain, by the Vehicle of the blood and nervous juice, do so bind, and shut up its too loose and open pores, that afterwards they do not lie open, for the passage of the Morbifick matter: Besides, for that these vapourous Concerts, breathe forth as it were an Armodiack scent or scattering; therefore they are said to purifie the animal spirits, to fix them, and to strengthen them, having put off their Heterogeneous *Copula*: This virtue purifying the spirits, proceeding from an Armoniac Salt, is more apparent in Remedies, which are taken from the family of Minerals and Animals, such are the preparations of the *humane Skull*, of *Blood*, *Amber*, and *Coral*, as the other, more binding, rather exists, in the parts and preparations of Vegetables.

It will not be needful here, for the curing of the Epilepsie, to propose a compleat method of healing, with exact forms of prescriptions, because there are extant every where among Authors, general Precepts, and most choice Remedies; and the prudent Physician will easily accommodate, both the Indications, and that plentiful provision of Medicinal stuff, to the particular cases of the sick. But because we have exhibited a quite new Theorie of this Disease, here also ought to be rendred a curatory method fitted for it: which we shall describe by and by more fully, after we have shewn you some Cases or Histories of people sick of the Epilepsie.

1. Observation.

A fair Maid, sprung from Parents indifferently healthful, being her self very well, till about her coming to ripe age, about that time, she began to complain of her head being ill: And first of all, she felt near the fore-part of her head, by fits, a vertigo or giddiness, whereby all things seemed to run round; and also whilst this symptom continued, she was wont to talk idly, and to forget whatever she had but just done: These kind of fits at first pass'd away within a quarter of an hour, and came again only once or twice in a Month, in the interval of which she was well enough: Afterward, the assaults being made more grievous by degrees, they also return'd more often, and within half a Year, her Brain being daily more weakend, this giddiness or turning round

was plainly chagg'd into the Epilepsie, that the sick being struck down to the ground at every fit, was affected with Insensibility, and horrid convulsions, and also with foam at the mouth. The Domesticks observed, that she always fell on the same side, so that sitting near the fire, if she sat in the right Corner she would be flung in the midst of the fire, but if in the left Corner, she fell against the wall of the Chimney: once when being left alone in the house, she fell upon the burning Coals, and so miserably burnt her face, and forepart of her head, that the skull being made bare of the skin and flesh, a deep and large eschar was burnt into it: and afterwards the outer shell of it fell off a hands breadth. In the mean time the sick Maid, so long as the ulcers contracted by the burning, ran with filthy matter, she was free from the fits; but afterwards, they being healed up, the falling evil returned: This Disease began first to shew itself about the time of Puberty; for this maid, presently after the beginning of it, had her Courses, and afterwards they constantly observed their set times, tho her distemper grew daily worse: Various kinds of Medicines being administred to this sick Creature, availed nothing, because it was the custome and practise of her and her friends, quickly to change both the Physician, and method of Physick, if any happy event did not presently follow, and to betake themselves very much to every Emperick, and outlandish Mountebank.

That in this Case, the Vertiginous Distemper, with a short delirium, was the forerunner of the Epilepsie, it plainly argues, the original of this Disease being planted in the middle of the brain, to depend upon a certain inordination of the Spirits; to wit, those dwelling there, at the beginning, begun to admit an heterogeneous Copula; which being more plentifully heaped up, being moved either of its own accord, or occasionally, while it was shaken off, induced by reason of the Spirits being disturbed, and not yet very explosive those former distempers; Afterwards, from the same cause by degrees growing worse, the perturbations of the Spirits did raise up their manifest explosions, and changed the vertigo, and *Delirium* into the Epilepsie.

But that this Maid began to be sick, about the time of ripe age, it hence evidently follows, as the natural ferment, so sometimes the præternatural, explicates it self, first at that time; wherefore as it happens, that the menstruous purgations do then first break forth, so the seeds of the falling sickness, whether innate or acquired, then budded forth a little, and by degrees were ripened into fruit: when the præternatural Ferment first appears, oftentimes the natural following blots it out, hence the Epilepsie of young ones, often ends about the time of puberty or ripe age, but if that ferment or taint of the disease, comes after the menstruous flux, or together with it, and ceases not presently, it remains for the most part afterwards, during life, of it self untameable, and not to be overcome by any Remedies.

From this Observation, that a Caustery accidentally, and by chance, being made on this sick party, freed her from the fits of the Disease, it may be inferred that fontanells or issues, may be profitably administred, in the cure of the Epilepsie: for wheresoever an emissary is opened for the constant carrying away of the serous water, both from the blood and nervous juice, there very many heterogeneous and morbid particles flow out with it, that therefore the brain might remain free.

The Daughter of a Brewer of *Oxford*, had been very obnoxious to a Rheume falling into her eyes from her Infancy, otherwise strong and sound enough, also accustomed daily to hard labour, about the 14. year of her age, she began to be tormented with Epileptick fits, of which she suffered near the greater changes of the Moon, especially then returning: Being asked to endeavour her Cure, I gave her a Vomit of precipitate Solar, and ordered it to be renewed three days before every new and full Moon; besides that she should take at every turn for four days after the Vomit, twice in a day, a dram of male-Pæonie root in powder with a draught of black Cherry water. By these remedies, the fits so long intermitted, that the disease seemed to be cured. Afterwards when they returned again, she was again recovered by the use of those medicines: and then the menstruous flux breaking forth, and observing its true periods, she remained for the future free from that disease.

The Therapeutic or Curatory Method.

IN the Curing of the Epilepsie, I judg it fit to begin with a Cathartick, and if the sick can easily bear vomiting, first let an Emetick be administred, and for several months let it be repeated, four days before the full of the Moon. For infants and youths, may be prescribed wine of Squills, mixed with fresh Oyl of Sweet Almonds; or also of Salt of Vitriol, from half a Scruple, to 1. Scruple: For those of riper years, and of a

Vomitaries.

stronger Constitution may be prescribed the following forms of Medicines. Take of *Crocus mettalorum*, or of *Mercurius vitæ* gr. iii. to vi. of *Mercurius Dulcis* grain xvi. \mathfrak{z} i. let them be bruised together in a mortar, mix it with the pap of a roasted Apple or of *Conserve of Burage* one Ounce, make a Bolus; or you may take an infusion of *Crocus Mettalorum* or *Mercurius Vitæ* made in Spanish Wine from half an Ounce to an Ounce and a half, or take of *Emetick Tartar* of *Mynsicht* gr. iv. to vi. who are of a tenderer Constitution, let them take of the *Salt of Vitriol* \mathfrak{z} i. to \mathfrak{z} ss, and half an hour after let them drink several pints of posset-drink; then with a feather or finger put down the throat, let vomiting be provoked, iterate it often.

The day following the vomiting, unless any thing shall prohibit, let blood be taken out of the Arni, or from the Hemerhod Veins with a Leech: then the next day after, let a purging medicine be taken, which afterwards may be repeated constantly four days every new Moon.

Purges.

Take *Resine of Jalop* \mathfrak{z} ss, *Mercurius Dulcis* \mathfrak{z} i. of *Castor* gr. iii. of *Conserve of the Flowers of pæony* one ounce, make it into a Bolus. Take *pill fætida* the greater \mathfrak{z} ii. of *Hysterica* what will suffice, make thereof v. pills. Take of the strings of *black hellibore* macerated in Vinegar, dried and powdered half an ounce of *Ginger* \mathfrak{z} ss. of the *Salt of Wormwood* gr. xii. of the *Oyl of Amber* drops ii. make a powder, let it be given in the Pap of an Apple. Take of the powder of *Hermodactilis* compound one ounce, of *humane Skull* prepared gr. vi. make a powder, let it be given in a draught of the decoction of *hyssop* or *Sage*.

On those days that they do not purge, especially about the time of the changing of the Moon, let there be administred Specifick Remedies morning and evening, which are said to cure this disease, with a certain innate and secret virtue: of these there are extant a very great company, and are prescribed in various forms of Compositions.

Specificks.

The most simple Medicines which experience hath found to be very Efficacious, are the Root of the male *Pæony*, and the seeds of the same. Take of the Root of the male *Pæony* dried and powdered one ounce, to ii. or iii. let it be given twice a day in the following Tincture. Take of the leaves of *Mistletoe* of the Oak two ounces, of the root of *Pæony* sliced half an ounce, of *Castor* one Ounce; let them be put into a close Vessel with simple water of *Betony* or *Pæony*, and white-wine, each \mathfrak{f} ss. of the *Salt of Mistletoe* of the Oak or the common *Mistletoe* two Ounces, let them digest close in the hot sand for ii. days, let them take three Ounces with a dose of the aforesaid powder.

Poor people may take of the aforesaid powder in a decoction of *Hyssop* or *Castor*, made with fair water and white-wine.

At the same time let the Root of *Pæony* be cut into little bits, and being strung upon a thred, hung about the neck. Also let the Roots being fried in a pan, or boiled tender, be eaten daily with their meat.

Take of the Root and Seeds of the male *Pæony* each two Ounces, of *Mistletoe* of the Oak, of the hoof of *Elk* one dram each let them be sliced and bruised, and put into a thin silk bag, and hang at the pit of the Stomack.

Powders.

Among the Specificks, this powder is greatly commended by many Authors. Take of *Castor* *Opopanax*, *Dragons blood*, *Antimony* and the seed of *Pæony*, each alike, make a powder, of which may be taken half an Ounce to one Ounce every morning, with wine or some proper decoction, or with *black Cherry water*.

Take of a mans Skull prepared one Ounce, of *Mistletoe* of the Oak, of *Counterfeit Cinabar*, of an *Elks Claw*, each half an Ounce, so mingle them. The dose is \mathfrak{z} ss. to a Scruple.

If the form of powder be distastful to any one, or if it should become loathsome by the long use of it, *Electuaries*, *Pills*, *Troches*, *Spirits*, and *Elixirs*, each of which agree with specifick medicines, are wont to be prescribed.

Electuaries.

Take of the *Conserve of the male Pæony*, of the *Lilly of the Valley* each three Ounces, of the seed and root of the male *Pæony* powdered each \mathfrak{z} ii. prepared *Coroll* \mathfrak{z} i. of the powder of *Pearls*, and of *humane Skull* prepared, each two scruples, of the salt of *Mistletoe* of the Oak \mathfrak{z} i. \mathfrak{z} ss. with what will suffice of the *Syrop of Corall*, make an *Electuary*, let them take of it morning and evening, the quantity of a Nutmeg.

Take of the Powder of the root of the male *Pæony* one Ounce, of the seeds of the same half an Ounce, of *Mistletoe* of the Oak, of an *Elks claw*, of *humane Skull*, prepared each two drams; of the roots of *Angelica*, *Contrayerva*, *Virginian Snakewood*, each \mathfrak{z} i. of the whitest *Amber*, of *Calcined Corall* each \mathfrak{z} i. of the Common sort of *Mistletoe*, \mathfrak{z} ii. of *Sugar Candy* eight ounces dissolved in what will suffice, of the *Antiepileptical water of Lavgius*. Make a Confection, of which take twice in a day the quantity of a Nutmeg.

Pills.

These Powders, by adding to them the *Salt of Amber*, and *barts-born*, with what will suffice of *Balsome Capivi* may be formed into a pilluary Mass, of which may be taken iii. or iv. pills, in the morning and evening, drinking after them a draught of some appropriate Liquor.

Of of those sorts may be prepared an *Elixir*, of which may be taken viii. drops to x. twice in a day, in a spoonful of a proper *Julup*, drinking a little of it after it.

Take of *Hungarian Vitriol* vi. Pints, let them be distill'd with a Glass retort in hot *Elixir*. sand for 24 hours, then let the same retort, being defended or done over with Clay, be put with a large receiver in a reverberating Furnace, that the acid spirits may be forced with a most strong fire, till they come forth. The whole Liquor being distilled, let it be drawn off in hot sand, in a lesser Glass retort, and let there be poured into the *Matrace*, of the roots of *Male-Pæony* cut into pieces and dried, four Ounces of the seed of the same, one Ounce of *humane Skull* prepared, of *Elks claws* and *red Coral* each half an Ounce, *Mistletoe* of the Oak ii. Drams; let it digest with a gentle heat for several days, to the extraction of a tincture, the Liquor being decantated, let it be drawn off in a Glass retort to a third part remaining: being stilled forth, keep it by it self: to those remains, pour of the rectified spirit of Wine a little quantity, impregnated with the infusion of the same ingredients, and let it digest for six days in Horse dung, the Dose of which is half a Scruple to a Scruple. The distilled Liquor may be given from half a spoonful to a whole spoonful, for the same intentions.

Or let there be prepared an Oil, out of the *Salt of Venus*, or *Copper*, according to the description of *Henry Van Heers*, and given as there prescribed.

Among the specifick Remedies, which (when the former shall not be profitable) *Empirical Remedies*. ought also to be tried, are the *Livers of Frogs*, the *Gall of a Boar* dried with Urine, the Powder of *Bryony Root*. The Powder of a *Cuckoe*, of *Crows*; the *Ruhnet* and *Lights of a Hare*, the *Liver of a Wolf*, *stones taken out of Swallows*, the *Liver of a Kite*, the *Eggs of Crows*; with many more, to be daily taken with Food or Medicine; a famous Catalogue of which is extant of *Henry Van Brays*, a Physician of *Zutphen*: and from which prescripts for poor people may be taken, easie to be prepared, and without great cost.

Whilst these kind of Remedies are to be taken inwardly, according to the aforesaid method, some outward administrations being applied, bring help, and are deservedly admitted to part of the cures; therefore, always Issues are made in this Disease, in one fit place or other; and also more often Vesicatories or Blisters.

Amulets hung about the Neck, or born at the pit of the Stomach, are thought to be useful: The fresh *Roots of Pæony* cut into little squares, and being strung like Bracelets, and hung round about the Neck, and as soon as they are dry, let new be put in their places, and they being reduced to Powder, may be taken inwardly: Take of the *Roots and Seeds of Pæony* each ii. Drams, of an *Elks Claw*, and *humane Skull* prepared, each one Dram, of *Mistletoe* of the Oak half a Dram, let them be beaten into gross Powder, and sewed in a piece of red Silk, and like a little bag, let it be hanged about the Neck.

An *Amulet* of a stalk of the *Elder*, found growing in the *Willow-tree*, is greatly commended.

It agrees with some, to have their heads shaven, and a Plaister applied to the forehead. Take of the root and seeds of *Pæony*, of *Castor*, *Mistletoe* of the Oak, of *humane Skull* most finely Powder'd, each one Dram, of *Bettyon* Plaister two Ounces, *Caranna*, *Tacamahacca*, each two Drams, *Balsum Capive*, what will suffice, make a mass, and let it be spread upon Leather, make a Plaister for the suters of the Head. *Plaisters*.

Let the Temples and Nostrils be often anointed with Oil of *Amber*, by it self, or mixed with Oil *Capive*.

Sneezing Powders, and such as purge the Head of *Rhume*, are to be used daily in the Mornings: Take of *white Hellebore* one Dram, of *Castor*, and *Euphorbium*, each half a Dram, the *Leaves of sweet Marjorum*, and *Rue*, each two Drams, make a Powder; make a decoction of *Sage* or *Hyssop*, with *Mustard* dissolved in it, with which gargle the Mouth and Throat. *Sternutories or sneezing powders*.

A Glister may be sometimes used, as need shall require.

Sometimes the more solid Medicines are to be moistned with liquids, or they ought to be drunk after them, for which end Distilled waters should be at hand, *Julups*, *Tinctures*, or *Decoctions*; which are endued with a certain Specific virtue against this Disease.

Take of *Hungarian Vitriol* four Pound, of the Powder of fresh *human Skull*, four Ounces, of the root of *Pæony* sliced, six Ounces, let them be bruised together in a Mortar, put to them either of *Spanish-wine*, or small *white-wine*, or wine made of the juice of *black-Cherries*, a quart; being fermented in a Vessel, let it be distill'd in a Glass-retort, in hot sand. *Distill'd Water*.

Take of the shavings of *Box-wood*, of *Hungarian Vitriol*, each two pound, of the *Mistletoe* of the Oak, or the common *Mistletoe* leaves, three handfals, of *Rue* two handfals,

fuls, being bruised together, put to it of *Spanish-wine*, four pints : Let them be distilled in a Glass Cucurbit, with hot sand.

Fulups.

Take of common *Vitriol* six pound, of the root of the *Male Pæony* six Ounces, of the *Mistletoe* of the *Oak* one Ounce, of green *Walnuts* eight Ounces; being cut and bruised, let them be distilled in a Glass-pot, a Glass *Alembick* being placed upon it, in hot sand. Take of this *Liquor* one pint, of *black Cherry-water*, and of the water of the flowers of the *Toil*, or *Line-tree*, each half a pint, of *white-Sugar* four Ounces, mix them, and make a *Fulup*; the Dose two Ounces to three Ounces, twice or thrice in day.

Oxymel of *Squils*, also an *hony decoction* with *Hyssop*, are much praised by the Ancients. Or an *Apozem* of this kind may be prepared, of which may be taken four Ounces, to six or seven, twice in a day.

Apozems.

Take of the roots of *Male Pæony*, *Angellica*, *Imperatoria*, *Valerian*, each six Drams, of the leaves of *Betony*, *Sage*, *Lilly* of the *Valley*, *Penny-Royal*, each one handful, of the seeds of *Rue*, *Nigella*, each three Drams, *Pæony* half an Ounce, of *Raisins* three Ounces, of *Liquorish* half an Ounce, being cut and bruised, let them be boiled in six pints of *Spring-water*, to the consumption of the third part. Towards the end, add of *black Cherry-wine* half a pint, or ten ounces, strain and keep it in close Vessels. The Dose is from six to eight Ounces, twice in a day, after the afore-prescribed Remedies.

Or the afore-said ingredients, excepting the *Liquorish*, and *Raisins*, may be boiled in six pints of *Hydromel*, or *Water* and *Hony*, or *Meath*, to the consumption of the third part. The Dose four to six Ounces.

Great Remedy.

If that the afore-said method, consisting in the use of *Catharticks*, and *Specificks*, being for some time tried, and altogether in vain, you must come to Remedies of another kind, and chiefly to those called Great, or Notable: In this rank are placed *Diaphoreticks*, *Salivation*, *Barbes*, and *Spaws*.

Alphonsus Ferrius affirms, That he had cured many Epileptical people, with a decoction of simple *Guaicum*, being prescribed twice in a day, and taken to six or eight Ounces, and its second decoction drunk (as in the cure of the *Pox*) instead of ordinary drink. If to such a decoction the roots of *Pæony* and other *Specificks* should be added, perhaps it would be more efficacious. It seems probable, that a *Salivation* strongly excited from *Mercury*, and afterwards a *Sudoriferous* or *Sweating-Diet* following, might certainly cure this Disease. What *Barbs*, or *Spaw-waters* are able to do, I have not observ'd, either by my own or others experience. Perhaps I have made trial, that our Artificial *Spaws* sometimes have been available in curing the Epilepsie, to wit, both those impregnated with *Iron*, and also with *Antimony*, and taken in a great quantity for many days.

CHAPTER IV.

Of other kinds of Convulsions, and first of the Convulsive Motions of Children.

After the Epilepsie, as it were the principal Spasm, in the chief place excited, to wit, within the middle part of the Brain; the other kinds of Convulsions come to be treated of in order. The differences of those are best taken from a twofold kind of cause, and the various manners and accidents of either. We have already shown that all Spasmodic Distempers do flow either from the meer irritation of the spirits, or from their explosion, by reason of the cleaving of an *Elastick Copula* to them, or jointly from both together: wherefore, the manifold Ideas of Spasms may be distinguished, and distributed into certain Classes, as it happens for this or that cause, or either together, to remain in the various places of the *Encephalon*, or the *Nervous Appendix*. For indeed, the Spasmodic matter, or the Explosive *Copula* of the spirits, finding a passage chiefly, and most often thorow the Brain, and sometimes in some measure thorow the extremities of the Nerves, subsists either about the origine of the Nerves, or their middle processes, or their outmost ends, or abounds in their whole passages, as shall be by and by more particularly declared. Further an irritation stirring up Convulsions by it self, or with a previous remote cause, although it be made every where in the *Nervous stock*, yet it chiefly, and more frequently produces such an effect, about the beginnings,

beginnings, middle processes, and foldings, or ends of the Nerves. But the same kind of cause and effects, are after one manner in Infants and Children, and another in Youths, and those of riper age. Since therefore we have determined, particularly to consider all the kinds of Convulsions, we will first discourse of the Convulsive motions of Infants and Children.

Infants and Children happen so ordinarily, and frequently to be tormented with Spasmodic Distempers, that this is reckoned the chief, and almost the only kind of Convulsions; for the symptoms of this kind, in other more ripe People, are wont to be called by other known Names, and referred to the Epilepsie, Hystrick, Hypochondriack, Collick Passions, or also to the Scurvey: but in Children they are called, as it were by way of excellency, Convulsions.

As to this we must observe, that Children are found to be greatly obnoxious to Convulsions, chiefly about two seasons, to wit, within the first Month after they are born, or about their breeding of Teeth: Although it often happens, that the assaults of this Disease may come also at other times, and from certain other causes.

In the first place therefore, it very often happens that Children newly born, or at least ere they are two Months old, are afflicted at every turn with Spasms, excited in divers parts; for that inversions of the Eyes, distortions of the Cheeks and Lips, or tremblings, yea contractions of the Tendons, and frequent jerkings or leapings forth of the Members, and sudden shakings of the whole Body infect them; and that the same effect likewise sometimes afflicts the *Præcordia*, appears plain enough, because whilst the Spasms busie the Limbs, and outward Members, also the Face becomes now pale, now of a livid, or dead colour, from the Blood stagnating in the Heart, and the Lungs being at that time contracted. As therefore, Spasms are wont to infect three regions of the Body in Children, to wit, the parts of the Head and Face, the outward Members and Limbs, and the *Præcordia* and *Viscera*, we observe now these regions, now those, now two, or all together to be possessed, by the Morbific cause, to wit, as it is fixed, either about the beginnings, or ends of the Nerves; and when the former of these happens, as the superior part of the oblong pith, the middle, or the lowest part of the spinal marrow is touch'd, one or more parts together are assaulted by the Morbific cause.

As to the other causes of this Distemper, to wit, the procatactic and evident, those of the former kind, do chiefly consist in two things: First, that all the parts of the Head in Infants are very weak, and abound with a viscous humidity; to wit, the Brain less firm, and the tone of the Nerves very loose, so that they are not able to bear the more light force of every matter, but the spirits inhabiting them, are easily incited into irregular Motions or Spasms, by the proper Liquor, wherewith those parts are watered, if it flows never so little immoderately, or at least more plentifully, than for the measure of so little strength. But in the second place, because it appears by observation, that Children, not only, nor all, who are of a more tender Constitution, are found to be prone to this Disease, therefore this ought to be rather accounted for a reason of the more remote Morbid cause, that the Blood, and Nervous Juice, are originally vicious in some Infants, by reason of evils contracted from the Womb: For that the sanguineous mass, wanting eventilation for many Months past, becomes impure in Children newly born; wherefore, broad and red puttings forth, like the small Pocks, shew themselves through the whole skin, in most Children, soon after they are born; to which sort of weakks, or efflorescences, if they are hindred or repressed, oftentimes dangerous exulcerations, about the parts of the mouth follow. Hence we may deservedly suspect such impurities of the blood, sometimes to be poured forth into the brain and nervous stock, considering their debility, and for that reason Spasmodic Distempers to arise; to wit, whilst the blood being vicious from the Womb, endeavours to purifie it self, it transfers its feculencies into the Head, which were wont to be exterminated by the putting forth the red gum, or red spreadings thorow the skin: Wherefore, a water now thin and serous, now thick and sticking, and either participating of preternatural Salts and Sulphurs, is laid up within these or those recesses and cavities of the Brain, Cerebel and oblong pith, the recrements of which, when they begirt the beginnings or ends of this or that Nerve, and sometimes many together, affix on the spirits inhabiting them Heterogeneous Particles, and apt for Spasmodic or Convulsive explosions. For as soon as the Nerves have deeply imbibed such Particles, the spirits being burthened with their *Copula*, endeavour either of their own accord, or being incited by evident causes, to thrust and shake it off; and so they enter into Spasmodic or Convulsive explosions.

The evident causes, which bring on Convulsive motions in Children predisposed, are of two kinds, viz. In the first place, whatsoever stir up unwonted effervescencies of the

the blood, whether they be excesses of heat or cold, a too plentiful nourishment, or hotter than should be, the changes of the Air and Weather, and chiefly the periodical times of the Moon; for by reason of these, and other the like occasions, the Blood growing more hot than by right it should be, affixes sooner to the spirits an Heterogeneous *Copula*, even to a fulness, and causes it presently to be struck off and exploded, by them thoroughly disturbed. Secondly, An irritation in almost every part of the nervous System, does not seldom bring into act, a Spasmodic or Convulsive Disposition: wherefore, not only an excess of tangible qualities outwardly inflicted, but the milk Coagulated in the stomach, choler, or other sharp humors, or also Worms knowing the Intestines, are wont to excite Spasms or Convulsions: Besides, these kind of evident causes, as they are stronger, sometimes induce Spasmodic Distempers of themselves, and without a previous disposition: even so Worms, and perchance sharp humors, cause Convulsive motions to some Children, at least to the more tender.

That it might more certainly, and to the sense appear, what kind of Morbific matter might be in Convulsive motions, I have opened the dead bodies of many which this Disease had oppressed: I have always in vain sought the cause within the Viscera, and first passages of Concoction; In the heads of many, a serous water being heaped up, within the Cavity, under the Cerebel, and distending the Membrane which clothes the oblong pith or marrow, did overflow the beginnings of the Nerves: in some, no footsteps of this Disease appeared: so that, what sticking to the spirits did irritate them into explosions, was of so imperceptible a bulk, and its original so altogether hid, that it could not be found out by the most perspicacious scrutiny of the sight. Sometime past, in this City, many Children of a certain Woman died of this Disease, at length the fourth, as the others, died within the Month; we dissected the Head, and here no serous Colluvies or Water did overflow the Ventricles, but only the substance of the Brain, and its Appendix, was moister than ordinary, and looser; what was most worthy of observation, was, that in the Cavity, which lies under the Cerebel, upon the trunk of the oblong pith, we found a remarkable heap of clotted, and as it were concreted blood: but in truth it is uncertain, whether this matter deposited there from the beginning, had primarily caused the Convulsions; or rather, whether this blood being extravasated and expressed, by the contraction of the parts planted round about, was not the effect and product of the Convulsions, and not the cause of them; for also in Apoplectical people this kind of Phenomenon ordinarily happens; which yet we shall afterwards shew to be rather the effect, than the cause of the Disease.

Indeed, the Heterogeneous Particles, which flow to the Blood, from the Womb, are wont to be sent away through Efflorescencies or Cutaneous Pustles in the whole Body in many Children, in others being poured on the head, are the material cause of the Convulsive Distemper, may be inferred, besides the reasons before recited, from the Remedies chiefly helping: For that in little Children, obnoxious to this hereditary Disease, the Convulsive Fits are best prevented, if that an Issue be made presently after they are born in the nape of the Neck, and blood drawn with a Leech from the Jugular Veins; for the corruptions of the Nervous Juice, are brought away by that, and the impure buddings of the blood, are diverted from the head by this: by these ways of administration, when before two or three Children, of the same Parent, have died of Convulsions, soon after they were born, all the rest have been freed from the same evil.

Secondly, Thus much concerning the Convulsive motions of Children, which are wont to infest them, by reason of an Infection contracted from the Womb. If that at this bout they should escape the Disease it self, or at least its deadly strokes, nevertheless, about the time of breeding Teeth, they would be found at last to be obnoxious to the same danger: for when the Teeth, especially the greater, are about to cut, oftentimes a Fever is excited, to which not seldom Convulsions are joined: and though at this time Children are grown stronger, and may better bear the fits of the Disease, than when new born, yet the Convulsive Distemper, now stirred up by no other grievous occasion, becomes very dangerous, and sometimes deadly.

But forasmuch as Children, who fall into Fevers about the time of breeding of Teeth, are not all tormented with Convulsions, it therefore follows, that some disposition to this Disease, either innate, or acquired, doth proceed; and that the pain caused from the breeding the Teeth, is to be esteemed only the means of a more strong evident cause, to wit, Children, who being indued either with a Cacochymia or Juice, causing ill digestion, or with a more weak constitution of the brain and nervous stock, have their animal spirits too much adulterated, or dissipated, are sometimes disposed for the coming of Convulsive Distempers: wherefore, when so acute pain, together with a Fever, afflicts, that latent disposition is brought into act.

If it be here asked, for what reason a fever, and then Convulsive Motions following thereupon, come to those disposed, in teething, it may be answered, that either effect may be attributed to the pain, as the immediate cause: We experimentally know by our selves, what the torment is, that follows an irritation about the roots of the Teeth; in truth so great and so cruel, that a more cruel can scarce be; for that one or two notable shoots of the fifth pair of nerves, reaches to the roots of each Tooth, which when it is hauled by the sharp particles of the Blood, or other humors, there laid up, causes a most sharp sense of trouble, or pain by its Corrugation: But this kind of Vellication or hauling of this Nerve, happens thus to children breeding teeth, because that the membranes and fibres are every way distended by the Teeth, now increasing into a greater bulk, and as yet included within the scarce hollow gums: hence the blood being hindered in its Circulation, causes a tumour, and so presses the nerves, and also pours on them the more sharp particles of the Serum, by which being notably pulled or hauled, they are tormented with Corrugations, and painful Spasms.

Therefore, when so cruel pains happen to children from their breeding Teeth, it is no wonder if a fever, and also convulsive motions sometimes follow: the former of these happens, both for as much as the blood being hindered about the pained part, is not circulated with its wonted and equal course, wherefore it becomes inordinately moved, in the whole body; and besides, because Spasms being stirred up somewhere in the nervous stock, the corrugated and contracted nerves, press together, and pull the arteries, and by that reason, stir up irregular and feverish fluctuations in the blood. But sometimes Convulsions happen in breeding Teeth, both because the blood growing hot, sends forth heterogeneous particles, to the animal government, and so stirs up the spirits into explosions; and besides also, when this acute pain, and as it were a lancing, follows upon the teeth being about to cut, it communicates a very troublesome and irritative sense, from the affected parts, to the first sensory, presently from thence, the motion of the rage is retorted by the same or other neighbour Nerves, which by reason of a previous disposition, doth not rarely become convulsive.

Besides these two occasions of Convulsions (which are wont to be chiefly, and more often in children) to wit, the times of Infancy and breeding Teeth, this Distemper also is excited at other times very often, and for other causes: For in whom the Seeds of the Spasmodick Disposition is sown, they sometimes unfold themselves presently after the birth, and are ripened into morbid fruit; or else lying hid for a while, they now come before the breeding of Teeth, and follow a long time after it; and by reason of other evident causes, to wit, either external or internal; of which sort are a sickly, or breeding nurse, milk Coagulated in the stomach, or degenerating into an acid or bitter putrefaction, a feverish distemperature of the head, ulcers or weakks of other parts suddenly vanishing, the changes of the air, the Conjunctions, Oppositions, and aspects of the Sun and Moon, and such like; they at length break forth into Act, from an uncertain event. Concerning these, there is no need, that we should particularly discourse.

When all the Children of a man dwelling in the neighbourhood, died of Convulsions, within the space of three months, at length to prevent that fatal event, they sought for remedies, for a child newly born: I being sent for, a few days after the being brought to bed, first advised the making an issue in the nape of the neck, then, that the next day after, a leech being applied to the jugular vein of each side, two ounces of blood should be taken away: Besides, that about every conjunction, or opposite aspect of the Sun and Moon, about five grains of the following powder should be given in a spoonful of Julap, for three days, morning and evening. Take of humane Skull prepared, of the root of the male pæonie, each. one dram, of the powder of Pearls half a dram, of white sugar one dram, mingle them, and make a very fine powder. Take of the waters of Black Cherries three ounces, of the antiepileptic of *Langius* one ounce; of the syrrup of the flowers of the male Pæony six drams, mingle them; also I ordered that the nurse at the same times, should take a draught of whey, or posset drink, in which were boiled the seeds and roots of the male Pæonie, and the leaves of the Lilly of the Vally; the Infant for about four months was well, but then began to be troubled with Convulsions: at which time, the same remedies being administered both to the child, and to the nurse, in a larger dose, Vesicatores also were applied behind the ears, and blood was taken by the sucking of a Leech, from the jugular veins: within two or three days the child grew well: afterwards, whenever within four or five months the Convulsions returned, it was cured again, by the use of the same Remedies. After half a year, the convulsive motions wholly ceased, but a painful Tumour arose, about the lower part of the *Spinæ dorsæ* or back-bone, from which proceeded a certain distortion

tion of the *Vertebrae*, or joints of the back-bone, and a weakness of the legs, and at length a Palsie. It seems in this case, that the Spasmodic or convulsive matter, being wont to come upon the brain first, and beginnings of the nerves, entering at last the Spinal marrow, and being thrust out at its further end, it wholly stopp'd up the heads of the appending nerves, and shut out the passage of the Spirits: to wit, because other narcotick and more thick, had joyned themselves to the explosive particles.

The Curatory Method against the Convulsive Distempers in Children.

IT is to be endeavour'd either to prevent the Convulsive passions, threatening Children and infants, or to cure them being already begun.

The Preservation of Infants from Convulsions.

For if the former children of the same parent, were obnoxious or liable to Convulsions, that evil ought to be prevented timely, by the use of Remedies to those born after. It is usual for this end, to put into the mouth of the child newly born, some antispasmodick Remedy, as soon as it begins to breath: from hence some are wont to give them some drops of the purest hony, others a Spoonful of Canary sweetened with Sugar, and some again oyl of Sweet Almonds fresh drawn, to some may be given half a Spoonful of epileptic water, or one drop of oyl of Amber.

Besides these first things given to Infants, which certainly seem to be of some moment, certain other Remedies and means of Administrations ought to be used: to wit, let one spoonful of Liquor proper to this distemper, be drunk twice a day: as for example: Take of the water of black Cherry and of Rue each an ounce and a half; of the *Antiepileptic of Langius* one ounce; of the *Syrrop of Corral* 3 vi. of prepared Pearl, gr. xv. mix them in a Viol. On the third or fourth day after the birth, let an Issue be made in the nape of the neck, then if it be of a fresh countenance, let a little blood to about an ounce and a half, or two ounces be taken by the sucking of Leeches, from the jugular veins, having a care lest the blood should flow out too plentifully in its sleep; let the Temples, and the hinder part of the neck be gently rub'd with such a like ointment. Take of the oyl of Nutmegs by expression 3 ii. of *Capive* 3 iii. of *Amber* 3 i. Let an Amulet be hung about the neck, of the roots and seeds, of the greater *Pæonie*, a little of the hoof of an *Elke* being added to it.

The Method of Curing to be used to the Nurses.

Moreover antispasmodick Remedies, should be daily given to the Nurse; let her take morning and evening, a draught of whey or posset-drink, in which the roots and seeds of the male *Pæonie*, and sweet fennil seeds are boiled. Take of the *Conserve of the flowers of Betony*, of the male *Pæonie*, and of *Rosemary* each ii. ounces; of the powder of the Root and flowers of the male *Pæonie*, each 3 ii. of red *Corall*, prepared, and of the whitest amber, each 3 i. of the roots of *Angelica*, and *Zedoarie* prepared each 3 ʒ. with what will suffice of the *Syrrop of Pæonie*, make an Electuarie; let her take morning and evening, the quantity of a Nutmeg.

Take of the powder of the root of male *Pæony* 3 ii. the seeds of the same 3 i. make a powder; of the whitest Sugar three ounces dissolved in the water of the flowers of the *Line-tree*; and boiled to tablets, of the oyl of *Amber* 3 i. make tablets according to Art, each weighing 3 ʒ. let her eat one every sixth hour. Also let her keep to an exact diet.

The Cure of Infants sick with Convulsions.

If any Infant be actually afflicted with Convulsions, because that an Issue operates little and slowly, it will be expedient to apply blistering plaisters to the nape of the neck and behind the ears, and unless a more cold temperament should gain-say it, let blood be drawn with Leeches from the veins: let Liniments be used about the Temples, Nostrils, and hinder part of the Neck, and plaisters also laid to the bottoms of the feet; Clysters that may keep down the belly, should be daily administred: besides let specific Remedies be inwardly taken, often in a day, to wit, every sixth or eighth hour.

Ointments.

Take of the oyl *Capive*, of *Castor* each 3 ii. of *Amber* 3 ʒ. make a Liniment. Take of the plaister of *Oxycrocia* two parts, of dissolved *Galbanum* one part, of oyl of *Amber* 3 i. make a plaister for the soles of the feet. Let there be given of the powder of *Ammoniacum*, according to the description of *Riverius*, twice or four times in a day.

Powders.

Take of humane skull prepared, of the seeds of *Pæony*, of an *Elks claw*, of *Pearls* prepared, each 3 ʒ. of *Amber greece*, gr. vi. make a powder; the dose vi. grains, in a spoonfull of the Liquor hereafter described, three or four times in a day.

Or take of *humane Skull* prepared, of pearls each 3℥ of the *Salt of Amber* ʒi. of the *Sugar of Pearl* ʒi. the dose ʒ℥.

Or take of the *Spirits of harts-horn* iii. drops, let it be given every sixth or eighth hour in a spoonful of the *Julup* below prescribed.

To the children of the poor, may be administered the powder of the *Roots of wild Vaireian* ʒ℥. to ʒi. let it be given twice a day, in a spoonful of milk, or appropriat *Liquor*.

Unzerus greatly commends the Gall of a sucking Whelp, to wit, that the whole juice of the gallie Bag being taken forth, be given to the child to drink, with a little of the water of the *flowers of the Tile, or Line-tree*.

A learned Physician lately told me, that he had known many cured with this Remedy: Besides, Empericks are wont to cause the bigger children, after they have drank the gall, to eat also the Liver of the Whelp broiled.

Julups, distilled waters, and other appropriat *Liquors*, may be prepared, after the following prescripts.

Take of *black Cherrywater* three ounces, of the *Antiepileptical water of Langius*, one ounce, of *perlate sugar*, ʒii. mix them.

Take of the green *Roots of the male Pæonie* cut into little pieces, six ounces, of *Hungarian Vitriol* eight ounces, of *humane Skull* two ounces, of the *Antiepileptical water of Langius* half a pint, mix them, and let them be distilled in a glass retort, in hot sand, the dose i. Spoonful to ii.

Take of the fresh roots of the *Male Pæonie* cut, four ounces, being bruised in a Marble Morter, pour to them of *Spanish-wine*, lib. i. make a strong expression, add of *mannus Christi* pearled, half an ounce, let it be kept in a close glass. The dose i. Spoonful, or ii. twice in a day.

When Convulsive motions happen by Reason of the difficulty of breeding Teeth, this Symptom as it is secondary and less dangerous, so the cure does not always require the first or chief labour of healing, but sometimes we are rather careful to remove it, by allaying the pain and the feverish Distemper; wherefore both the patient and the Nurse ought to use a slender and refrigerating Diet; the Teeth being about to break through the Gums, their passage should be made easie, by rubbing or cutting them; and also *Anodynes* should be applied to those swelled and grieved parts: Clysters and taking away blood are often used; it behoves to cause sleep, and to attemper the fierceness of the blood: sometimes antispasmodick Remedies are made use of, but the more temperate, and such as do not trouble the blood and humors, Vesicatories or blistering plaisters, because they aptly evacuate the serum, too much poured forth on the head, oftentimes bring help.

Convulsions by reason of breeding of Teeth.

When children are troubled with Convulsions, not presently after they are born, nor by reason of the cutting of their Teeth, but for other occasions and accidents; the cause of such a distemper, for the most part, subsists either in the head, or some where about the Viscera of Concoction. When the former is suspected as it is wont to be manifested by signs which argue a *Serous Colluvies*, too much heaped up within the Head, the former Remedies, already recited, ought to be given in a larger dose; besides, in those who are able to bear purging, sometimes a Vomit, or a light purge is prescribed: *Wine* and *Oxymel of squills*, also *Mercurius Dulcis*, *Rhubarb*, and *Resin of Jalop*, are of approved use.

Spasms or Convulsions caused from other occasions.

As often as the cause of the Convulsive Distemper seems to be in the Viscera, either Worms, or sharp humours, stirring up the torments of the belly, are understood to be in fault.

Against Worms, a purge of *Rhubarb*, or *Mercurius Dulcis*, the *Resin of Jalop* being added, is ordained: sometime past, a Child being miserably afflicted with Convulsions that he seemed to be just dying, I gave him a dose of *Mercurius Dulcis* with *Resine of Jalop*; with his stools, which were four, he voided xii. worms, and presently grew well.

By reason of worms.

Take of the root of *Virginian Snakeweed*, in powder ʒi. of *Coral calcined to a whiteness* ʒ℥. a powder ʒi. the dose from half a scruple, to one scruple, twice in a day, continued for three days, drinking after it a decoction of *Grass-roots*. Take of the species of *Hiera* ʒi. ʒ℥. of *Venice-treacle* ʒii. make a plaister for the bottom of the belly, or apply to the Navel a plaister.

If the Convulsive motions are suspected to proceed from an irritation of the Ventricle, and intestines, made by sharp humours, a gentle purging, either by vomit, or stool, or both successively ought to be. For this end, let them drink a gentle Emetick of wine of squills, or salt of vitriol; when even the sick are troubled with a striving to vomit of their own accord: but if the other evacuation, or downwards, shall seem better to be tried, they ought to take an Infusion of *Rhubarb*, or the powder, and Syrup of *Succory* with *Rhubarb*, or of *Roses* with *Agaric* and very often by these Remedies, timely applied, I have seen the Convulsive Distempers in Children

to be cured : besides, in this case, Clysters are frequently used : but external Medicines are not to be omitted ; to wit, Fomentations, Oyntments, Plaisters applied to the Belly.

Take of the flowers of Cammomet cut very small, two handfuls, let them be put into two little bags made of fine Linen, or Silk, which being dipped in warm Milk, and wrung out, may be applied successively to the abdomen, or lower region of the Belly.

Take of the tops or flowers of Mallows, in like manner, but small, let them be fried in fresh Butter, or Hogs Lard, and in the form of a Liniment, or a Cataplasm, applied to the Belly.

CHAPTER V.

Of Convulsive Diseases of Ripe age, arising chiefly by reason of the Nervous origine being affected.

Although Convulsive Distempers, which happen to those of riper years, being known by other Names, also are commonly reputed of some other stock, and are wont to be referred to the Passions called Hysterical, Hypochondriacal, or Colical, or to the Scorbutic ; yet if the matter be a little better considered, it will easily appear, that some Convulsive symptoms, both in Men and Women, do come from the brain, which Convulsions properly and truly challenge to themselves the Name : But these (as we have already mentibned) may be distinguished after a various manner, by the manifold seat of the Morbifick cause, but chiefly into these three kinds, viz. Into Spasms or Convulsions stirred up, by reason of the origine of the Nerves being chiefly affected ; into others being stirred up, by reason of the extremities or ends of the Nerves being possessed by the Morbifick matter ; and lastly, into such from whose head the Morbifick Matter descending, fills the whole passages, or the most part of some certain Nerves, or of all together.

Three kinds of Convulsions hapning to those of riper years.

Distempers arising from the Nervous origine distinguished.

1 According to the various Nerves being affected.

2. According to the various places of the same Nerves being affected.

Therefore, that we may proceed to unfold the Convulsions arising from the beginnings of the Nerves being affected, take notice here, that the Morbifick matter besieging the beginnings of the Nerves, doth sometimes chiefly flow into the first pair of Nerves, to wit, which respect the Muscles of the Eyes and Face, and from thence the contractions and tremblings, now of the Nose, Cheeks, or Lips, now of the Eyes, or the distortions of the Mouth, follow. Secondly, Sometimes the wandering and intercostal pair do chiefly imbibe the Heterogeneous Particles ; and then Inflations, or Contractions of the Abdomen and Hypochondria, and also the palpitation of the Heart, trembling, difficult and interrupted breathing, an intermitting pulse, and other symptoms of the middle, and lower Belly, do very much infest. Thirdly, But sometimes the Morbifick cause being placed lower, affects chiefly the spinal marrow, and therefore the outward members and limbs, are rendred obnoxious to inordinate leapings forth and contractions : Further, in very many cases of this nature, because the animal spirits being exploded about the origine of the Nerves, do inordinately leap back towards the *Encephalon* ; for that reason, to all Convulsions almost being excited by this means, the *Vertigo*, also the *scotomie* or giddiness, the tingling of the Ears, and sometimes the amased insensibility or falling down of the spirits, are joined, or follow.

But as we may conjecture, from the various figures of the Convulsive Distemper, it seems, that the Convulsive matter hauling those, or these Nerves, or many of them together, is lodged either about their beginnings, only, so that the spirits in that place being often exploded, a frequent and very troublesome *Vertigo* arises, besides tremblings, and a short faintness about the *Præcordia*, swoonings and often leapings, and light contractions in the Viscera, or Muscles are felt. Or, Secondly, The explosive Particles being dilated to the beginnings of the Nerves, enter more deeply into their processes, and not seldom being slidden down into the Nervous foldings, belonging to the *Præcordia*, or the *Viscera* of the lower Belly, or also to the exterior members, procure there other as it were nests of Convulsive Distempers, that as often as the spirits about the Nervous origine are driven into explosions, presently fits, as it were Hysterical, Asthmatical, or otherways Convulsive, arise in the Abdomen, Thorax, or Limbs : Examples of these, and by what means they are made, shall be anon more clearly delivered : In the mean time, the Spasmodic matter flowing into the pipes of the Nerves,

when

when it is transfer'd even to their processes and remote enfoldings; yet, forasmuch as it hath still its chief mine about the Nervous original, therefore after very grievous Convulsions of the Viscera or Members, a great perturbation of the Brain follows thereupon, with a tingling of the Ears, a Vertigo, and often an insensibility or amas'd excurtion of spirits: but sometimes the Morbific matter, as to the greatest part, being translated to the farthest ends of the Nerves, from thence they become free or clear about their beginnings: For I have observed many, who, whil'st at the beginning, they were infested with the Vertigo, often fainting away with fear, head-ach, and heaviness about the hinder part of the head, to have felt about the *Præcordia* or *Viscera*, only light inflations or tremblings; but afterwards, suffering more cruel Convulsions about these parts; they did not complain of the former Distempers of the Head.

If it should be further demanded concerning the Convulsive matter, from what place it should be brought, and by what ways carried towards the beginnings of the Nerves, and what kind of settlement, and as it were cherishing nests it there obtains; we say, that although we cannot detect the footsteps and manifest passages of this matter, yet so much may be collected from certain observations, and the Analogie of things, it may be supposed there are these two distinct manner of passages, whereby the Convulsive Particles being first poured out into the Brain and Cerebel, from the Blood, are from thence carried towards the beginnings of the Nerves, *viz.* First, sometimes this matter being imbibed by the Brain and Cerebel, and by degrees passing thorow the pores of either, slides into the trunk of the oblong marrow, whose tract being also overcome by it, together with the nervous juice, it slides forward towards the original of the Nerves, and is heaped up near their heads, or within the medullarie trunk it self, or within the annularie Prominencies, in which places, either a long while subsisting, it stirs up frequent *Vertigoes*, and more light Convulsions, in remote parts as hath been said; or being slidden from thence, more deeply into the passages of the Nerves, excites fits of Convulsions very cruel: such a progress of the Morbific cause, we suspect in whom the vertigo, swooning, heaviness of the head, and torpor of the mind go before the Convulsive assaults: Indeed, the matter of the Disease, abounding as yet in the brain and marrowie appendix, produces these kinds of previous Distempers; which being slidden from thence into the Nerves, causes Convulsions.

By what means the Convulsive matter flows into the Nerves.

Secondly, There is yet another way, whereby it plainly appears, that the material cause of the Convulsive Distemper is transferred to the beginnings of the Nerves, to wit, when the same being deposited by the *serous water* within the cavities or ventricles of the Head, it is insinuated into the neighbouring roots of the Nerves: For in *Chronic* Diseases, when the remarkable discrasie of the blood and humors happens also to be accompanied with a praved disposition of the brain, oftentimes a great plenty of sharp *Serum* infesting the Nervous stock, dropping forth from the Vessels of the *Chorooidan*, or retiform enfoldings, slides into the ventricles of the brain, and its appendix: But this *serous water*, afterwards breaking thorow the under-spreading of the *Cerebel*, into the fourth Ventricle, the little skin there being displaced, whereby the oblong marrow is uncovered, it falls upon the beginnings of one or more of the Nerves, and either by irritating, or imbuing them, with Heterogeneous and Explosive Particles, induces the Convulsive disposition. And this for the most part is the cause that sick people, after long and ill handled Fevers, also after the more grievous *Cephalic* Diseases, at length die of Convulsions; as I have found by the frequent Anatomie of the Carcases of those who died by that means. Also it appears by Anatomical observation, That the brain may be overflowed by a certain *serous water* without the Distemper of the Convulsive disposition; and further, that in some, who died of the Epilepsie, and other Convulsive Diseases, there was no deluge of the *Serum*, within the Ventricles of the Brain: by which it is given us to be understood, that the Convulsive Distempers do not flow only from the watery matter in the Head; but that they arise not at all from such a cause, unless the *serous water* overflowing the Ventricles of the Brain, and chiefly that underlaying of the *Cerebel*, be imbued with Heterogeneous and Explosive Particles. I remember once, my Counsel to be ask'd for a young man labouring with an egregious Phtisis, and at that time truly desperate, besides a Cough, and shortness of Breath, he had grievously complained for many days, yea weeks, that he could not lie upon his back in his bed, or whilst he sat in a Chair he could not lean his head backwards: for that by this, or that posture of his Body, he was wont presently to suffer tremblings of his heart, and a fainting of the spirits, as if he were just about to die: wherefore of necessity he was fain to hold his head upright, or leaning forward. After he was dead, his Carcase being dissected, his Lungs appeared all over rumified, and in some places ulcerated: then his Skull being opened, there flowed within all the *Ventricles* of the brain, a great quantity of yellow and salt *Serum*: which

which water certainly whilst it did slide forward upon the fourth *Ventricle*, about the trunk of the oblong marrow, his head leaning back, rushing upon the heads of the wandring and intercostal pair of Nerves, did stir up the aforesaid Convulsions about the *Præcordia*: but so long as his head was inclined forward, that the heap of *Serum* flowed back into the interior *Ventricles* of the Brain, the origine of the Nerves remained free from that Convulsive matter.

Having hitherto shown how many ways, and by what passages the morbid matter, being dilated towards the origine of the Nerves, seems to bring on Convulsions, it were easie, according to these reasons, to unfold many Convulsive symptoms: for besides the Convulsive motions of Infants and Children, oftentimes excited from the same kind of causes; hither may be refer'd the contractions, and sudden leapings forth of the nervous parts, which follow upon Fevers. As also those Passions commonly called *Hysterical*, also *Hypocondriacal*, and certain others, proceed not seldom from the Morbific cause, rushing upon the beginnings of the Nerves. We will therefore endeavour to establish the truth of this *Hypothesis* by some other Histories and examples of sick people; but in the first place, we will propose observations of that kind, in whom the Morbific matter settling upon the beginnings of the Nerves, and not being as yet slid deeply into their processes, induced frequent *vertigoes*, and only more light Convulsions of the *Viscera* and *Præcordia*.

i. *Observation.*

A Noble Woman about 30 years of Age, of a tender constitution, and lean in Body, was wont every winter to be grievously afflicted with a *Catarh* or Rhume flowing upon the wind-pipe and Lungs, with a hoarse Cough, and great spitting; but the last year, great care and diligence being used, she avoided that evil. But after the winter Solstice, having taken cold, she was troubled with an huge pain of the head, a tingling of the Ears, a giddiness, with a great defluxion upon the Eyes, that it easily appeared, that the heap of *Serum*, which before this time was wont to distil into the Breast, was now wholly laid up, within the head and brain: besides, an effect of which was, that as often as she began to sleep, she was greatly infested with Passions, as it were *Hysterical*, to which she had never been before obnoxious: For when ever, being sleepy, she closed her Eyes, presently a bulk ascending in her belly, a choaking in her throat, tremblings, and leapings about the *Præcordia*, were stirred up; which affections notwithstanding quite ceased, when she was thorowly awakened, so that the sick party was necessitated to abstain almost altogether for many days and nights from sleep.

Being sent for to this Lady, after she had been sick and weak for many days, I was compelled at length to use gentle Medicines: therefore I took care that blood should forthwith be drawn from the foot, to four Ounces, and every day a Clister of Milk and Sugar to be administred, by which she was wont to have three or four stools: besides I gave her every eighth hour a Dose of the spirits of *Harts-horn* in a spoonful of the following *Julap*: Take of the water of *Penny-royal*, of *Walnuts*, and *black Cherries* each four Ounces, of *Hysterical water* two Ounces, of the Syrrup of *Clowe-gilliflowers* an Ounce and a half, of *Caster* tied in a little knot, and hanged in the middle of the glass half a Dram, of the Powder of Pearls one Scruple, mingle it. I caus'd with success a *viscatorie* to be put behind the Ears, and a *Cataplasim* of the leaves of *Rue* and *Cuccoe-pint*, with the Roots of *Bryony*, *Bay-salt*, and *black soap*, to be laid to the soles of her feet. Sometimes I gave her in the evening in a little draught of the prescribed *julap*, half an ounce of *Diacodium*, to which succeeded a moderate sleep, without the wonted Convulsions following: which kind of effects from opiats exhibited in the like case, I have often experimented: for the quenching her thirst I gave her a *Prisn*, with diuretick Ingredients boiled in it: by the use of these, she was very much eased, in a short time. But what proved a great benefit to her, was, that an Imposthume in her ear, breaking of its own accord, poured forth, at first a yellow matter, and afterwards for many days, a great plenty of thin *Ichor* or *Excrement*, by which Evacuation, the Convulsions of the *Viscera* and *Præcordia* wholly ceasing, the disease was perfectly cured.

As to the Reason of the aforesaid sickness, without doubt, it seems, that those Distempers were excited by the serous colluvies, laid up within the bounds of the Head: for the translation of that humor into the head, brought at first both the Disease, and the Secretion or flowing of it out, thorow the Emunctuaries of the ear, took away all the Symptoms: Besides, when the morbidick matter had brought in to the spirits, planted about the beginnings of the nerves, a disposition somewhat explosive, they, though being struck as it were with madness, they were continually troubled, yet so long as leaping back towards the brain, they obtained a space, in which they might be more freely expanded or stretched forth, they did indeed only more vehemently exercise the Phantasie, and without farther trouble did only cause watchings. But when by sleep

sleep sometimes creeping upon her; the excursion of the unquiet Spirits were restrained towards the Brain, (which indeed necessarily happens, when we sleep, the nervous Liquor within the pores of the brain, at that time being more plentifully admitted) they tumultuously rushing upon the heads of the wandering pair, and intercostal Nerves, troubled the whole series of Spirits, flowing within the passages of those Nerves, and so caused the aforesaid Convulsions, about the *Præcordia*, *Viscera*, and muscles of the throat. I have known many both Men and Women sick after this manner, who when they have been troubled with an headach, an heaviness of the hinder part of the head, or a *Vertigo*, have while they slept, felt forthwith in their *Præcordia*, or *Viscera*, or in both together, perturbations as it were Convulsive; which indeed happens from the bending downward of the tumultuating Spirits, being reflected from the brain, upon the beginnings of the Nerves: But that the use of opiats, brought a pleasing sleep to this sick person, without the wonted Convulsions, following, the reason was, because the animal spirits, as unquiet and furious as they were, yet by the Intanglement of the Narcotick Particles, they were bound as it were in Chains, that afterwards, without any resistance they were overcome by sleep. I have indeed very often happily cured, most grievous fits of Convulsions, both Asthmatical, and as it were Hysterical, by administering Opiates.

An honest woman M. G. of 67. years of Age, yet of a florid countenance, and fat in body, when she had been a while obnoxious at first to a swelling of the face, and very grievous fits of the headach, she fell through the great cold of the winter, into a very troublesome *Vertigo*, with a trembling of the heart, a fainting away of the Spirits, and a frequent striving to vomit: being layed in her bed, if she opened her eyes, or turned her from one side to another, she was presently troubled with a notable giddiness, or swimming in the head, with swooning and effectless vomiting. Visiting this woman, I doubted not, but that the cause of her sickness was, the Convulsive matter, being translated from the exterior region of the head, to the most inward recesses of the *Encephalon*, by whose inspiration or heterogeneous *Copula*, the animal spirits being touched while they leaped forth inordinately towards the brain, they excited the vertiginous Distemper, and while they rushed tumultuously upon the heads of the nerves, the Scotomie, disorder of the *Præcordia*, and endeavouring to vomit. A large Vesicatory or blistering Plaister, being applied to the nape of the neck, and behind her Ears, Clusters daily administered, also the use of *Spirits of harts-horn* frequently, and of a Cephalick Julup, cured her within a few days. 2. Observati-
on.

A noted man about 33. years of Age, when he had been for a long time subject to a Cough, with great and thick spitting, besides having the pores of his skin very open, he was wont to sweat continually, and every night to be wet with it: about the beginning of the spring, he perceived those usual evacuations to happen more sparingly; in the mean time, he complained of a fulness of his hands and feet, and as it were a certain swelling or puffing up, so that he feared a dropsie was coming upon him; besides he was troubled in his head, with a giddiness and frequent *Vertigo*: A little after, this evil increasing, light contractions, and sudden Convulsions, were ordinarily excited about his Lips, and other parts of the mouth and face; also presently after (the morbid matter as it should seem, flowing upon the beginnings of the wandering pair and intercostal nerves) he was afflicted with the trembling, and leaping of the heart, with frequent fainting away of the vital spirits, as if a *Leipothermy* or swooning was falling upon him. 3. Observati-
on.

I know that very many ascribe these Convulsive passions, so grievously infesting the *Præcordia*, to the vapours rising from the spleen: but it seems much more reasonable to deduce them from the Convulsive matter laid up within the brain, and rushing upon the beginning of the Nerves; because a shifting or translation of some excrements, from some other parts, to the head, goes before, and that it is so laid up, within the compass or bounds of the *Encephalon*, the almost continual vertiginous distemper, and the Convulsions of the parts of the mouth and face, testify it plainly: wherefore I thought good to prescribe to this man Remedies according to the method hereafter shown.

I might be able here to propose many observations of this nature, in whom the morbid matter, subsisting near the beginnings of the nerves, stir up light Spasms or Convulsions only of the *Viscera* or members with a *Vertigo*. But because a portion of this matter, descending from the head, enters more deeply the pipes of the Nerves, and so strows the tinder or enkindling of explosive seed, as it were gunpowder, about their middle and ultimate processes and enfoldings, it will be to the purpose to add some examples of this kind.

A certain young maid E. L. tall and handsome, sprung from sound parents, and herself (as far as might be perceived) originally healthful, after she had served a master long sick, being a long time, and almost continually with him, and was forced to watch whole nights very often, and also at other times, so that she never slept but short and interrupted. 4. Observati-
on.

interrupted naps; she at length begun to complain of an heaviness in her head, and a frequent *Vertigo*: within a little time after, the distemper growing worse, she felt tremblings in her whole body, with a light shaking of her members, which came at certain times, tho' wandering and uncertain: afterwards she suffered fits plainly Convulsive, and those horrid, and often inselting: a little before the approach of the disease, she was afflicted with a short *Scotomie* or swimming in her head, by and by she felt a streightness, and great oppression of her Breast, whereby all her *Precordia* were drawn together: then presently gnashing her teeth, and giving a great groan, she was wont to fall to the ground, in the mean time she was sensible, but labouring with the great oppression of her heart, till that constriction of her breast was loosned, she was not able by any means to rise; afterwards, when the fit was past, she was disturbed a good while, with a great palpitation of the Heart, an heaviness of the senses, and a great debility of the animal function. After that this Sick maid had lived subject to these kind of fits, being very often repeated, for about 14. months, she at last became Epileptical, that as often as the assault of the evil returned being flung prostrate on the Earth, she was taken with the Insensibility or amazedness of Spirits, with the foaming at the mouth, and other peculiar symptoms of the falling sickness. Neither did this distemper stay here, but ere the space of a year was elapsed, it degenerated into madness, that at last the sick maid, having lost the use of her Reason, grew sometimes mad with fury, and sometimes was plainly stupid and foolish.

The reason of
the aforesaid
Case.

It is plain from the beginning, progress, and often *metamorphosis* of this Disease, that it at first had its cause and seat in the head, near the beginning of the Nerves, and from thence did daily unfold more largely its bounds, both into the brain, and nervous System; for from the beginning, the morbid matter consisting near the beginnings of the nerves, caused only lighter Spasms or Convulsions of the *Viscera* and members, and shakings, with the *Vertigo*; afterwards a portion of it being slid into the pneumonic nerves, and their foldings, produced most grievous Convulsions of the *Præcordia*, *Diaphragma*, and *Ventricle*; and also another portion of the same matter invading the brain, and its marrow, caused the Insensibility or Amazedness, and so the fits of the Falling-sickness; and at length, the texture of the spirits being wholly vitiated, and their *Latex* being degenerated into a most sharp, and as it were Stygian Liquor, the Convulsive distempers passed into madness.

Therefore, as to the particular reasons, both of the disease, and symptoms, it seems, that the aforesaid Virgin, by her sedentary Life, (she being deprived altogether of the exercise of the body, and the use of a more free air) but chiefly by her nightly watchings, and being frequently interrupted of her sleep, she had contracted a vicious disposition of the blood and humours, and also a praved and weak constitution of the brain, and Nervous stock (to which may be added, that she did perpetually attend on a Master, sick of most grievous distempers of Convulsions, and by that means had received perchance some contagion, or convulsive infection: and first of all indeed, the Heterogeneous Particles being poured forth, together with the nervous juice, into the brain and Cerebel, and there cleaving to the spirits, as it were skirmished with the preliminarie *scotomie*, and vertigenous distemper; then the convulsive matter, settling upon the beginnings of the wandering pair, and intercostal Nerves, and the spinal marrow, brought in, with the *Vertigo*, the leaping of the *Viscera* and Muscles, and their lighter shakings: Afterwards when entering more deeply the pipes of the Nerves, it was carried into the Cervical, and Cardiac, and perhaps intercostal, and other unfoldings, and embued the spirits, performing the office of respiration, and the pulse, with an explosive *Copula*; they being brought into explosions at every turn together with their superiors, inhabiting the nervous origine, by reason of fulness, or because of irritation, excited most horrid Convulsions of the respective parts: But the fit growing strong, from the pneumonic or breathing Nerves being strictly bound, the sudden inordinate systole of the Thorax was stirred up; then presently the *Diaphragma* being suddenly and vehemently drawn back, the obstreperous ejaculation did succeed: Further, when by reason of the systole of the Thorax, being sometime continued, the blood being hindred, that it could not move, it stagnated altogether in the *Præcordia*, therefore, during the fit, that great oppression of the heart, with want of speech and motion afflicted the sick Maid: But in the mean time, while as yet the region of the brain remained free and clear from the explosions of the spirits, the sick party remained in her senses, or memory: but afterwards when the Convulsive matter being daily increased, it was unfolded in the middle or marrowy parts of the debilitated and broken brain, to the former passions; about the *Præcordia*, came also the insensibility and amazedness of spirits, then the Epilepsie, and lastly madness, for the reasons before recited. Many Medicines, and of various kinds, being prescribed to this sick Maid, by many, both Physicians and Empe-

ricks, but confusedly, and with an uncertain method, being presently changed, did her no good.

A certain fair woman, well coloured, and well flesh'd, from a settled grief, fell into a sickly disposition; about noon, and the evening, for the most part she was pretty well, but in the morning when she had sleep enough, and often indulged in too much, till she became very somnolent and heavy: being thoroughly awakened, presently she was wont to complain of a heaviness, and as it were a stupidity in her whole head, with a *Vertigo* at every motion, or stirring about of her head; a little after she constantly expected a Convulsive Fit, or the insensible amazedness of the spirits, and sometimes this, sometimes that, was wont to infest her: for that after the *Vertigo*, as it were a *previous Vellication*, for the most part, she felt in her ventricle, and left side, an heavy or weighty pain running up and down here and there; hence belching, a striving to vomit, eruptions of blasts, also wonderful distentions of the abdomen, and hypochondria, did follow; and sometimes for many hours, did miserably exercise this Woman; but sometimes these Symptoms hapned to be wanting, and then the distemper more cruelly afflicted her brain: for falling into frequent insensible fits, she was wont to continue a great while immovable, and with her eyes shut, without sense or understanding; and when her servants had moved her by rubbings, and with the fume of Tobacco, she came by and by to her self, but presently again she fell into the like insensibility, and so for four or five times, before she could perfectly recover her self, and be without expecting to fall into these fits again: At length the Tragedy being acted, she remained however affected with an heaviness and torpor of head, in some measure: but about noon, all the clouds being disclouded, she was wont to obtain a fair, and serene disposition of her whole head, until the next morning, the same Symptoms would return again.

Who shall rightly weigh these Symptoms, need not suppose them vapours, arising from the Womb or Spleen, and in those seek for the morbid cause in vain: which truly may more certainly lie placed in the head itself: for it seems, that by reason of a great sadness (which happens often to women) at the beginning, a great debility, together with a vitious taint, was impressed on her brain; so indeed that the animal spirits derived to the brain and Cerebel, brought with them heterogeneous particles of a mixt kind, *viz.* Partly narcotick or stupifying, and partly explosive or rushing forth: which kind of Copula, when they had more plentifully conceived, through sleep they were stirred up to the shaking of it off, by mere fulness: as soon therefore, as the woman was awakened, the same spirits being moved, either a bending downward being made below, they were depressed upon the beginnings of the Nerves, and there being exploded, they excited Convulsions of the *viscera*; or leaping back towards the middle of the brain, and being there struck off, they brought in those frequent and terrible Insensibilities. In truth, this distemper was somewhat akin to the Epilepsie, but that the morbid matter was not as yet stayed within the regal palace of the brain, or its middle part, so that there it might infect the spirits within the fountains; but yet the same heterogeneous Copula, did cleave more strictly to them, dissociated or disjointed below, and dividing themselves into various and lesser rivolets according to the beginning of the nerves. In the mean time, the spirits, whereby they might shake off that matter, being often exploded, caused the stupor and insensibility, but bending to some other place, they rushed upon the beginnings of the nerves, for that reason caused those Spasms or Convulsions of the *viscera*: but that the fits come only in the morning after a plentiful sleep, the reason was because the heterogeneous Copula of the spirits, coming to them with the nervous juice, was at that time gathered together to a fit fulness for explosions, which being then wholly shaken off, the sick person remained therefore all the rest of the day free from the distempers, till the next day, when the night Sleep had brought to the head, a new supplement of morbid matter, the like fit returned in the morning, which perhaps, as the Sleep had been shorter or longer, was moved now within the brain, now near the nervous origine.

But it may be observed, that Convulsions have arisen from the nervous origine, being chiefly affected, not only in the female sex, as the weaker and more liable, but sometimes these kind of distempers have been excited in men from the like procatartick cause. Some years since, being hastily sent for from a stranger, who lodged in this City, at first sight, I suspected that he was possessed, and believed that he had more need of Exorcisms, than of Medicines. He was about Forty years old, who had now for about three years, at certain set times of the year, been wont to be troubled with convulsive Motions; whilst he by chance lodged here for a few days about his occasions, by reason of a great sadness, he had a fit of his sickness greater than usual: He was wont for two or three days beforehand to feel the coming of his disease; to wit, from a great

An Observation of a distemper as it were hysterical in a man.

commotion within the forepart of the head, almost a continual *Vertigo*, and frequent dimness of his eyes: But the fit coming on him, at first his eyes were variously roled about, and inverted, then a certain bulk, like a living animal, was seen to creep from the bottom of his belly upwards, towards his heart and breast, and from thence to his head: I my self pressing his belly with my hand, felt very plainly this kind of motion, and as long as I hindered this round thing from ascending with both my hands, and all my strength, he found himself indifferently well; but as soon as this swelling creeping upwards by degrees, had reached the head, presently the members of the whole body were cruelly pulled together, that he would dash himself against the walls or posts, as if possess'd by an evil spirit: He could hardly be held, and restrained by four strong men with all their force, but that he would leap from them, and sling out his arms, feet, and head here and there, with divers manners of motions: when he ceased from leaping forth, or struggling, his Members would be strongly extended, and his muscles stiff, as if troubled with the Cramp or stiff extension: such a fit would last about a quarter of an hour, then coming to himself, he would talk soberly, and walk about in his Chamber; he knew what he had suffered, and asked pardon of the standers by; presently after he began to draw his eyes inward, and swiftly to role them about: then presently the convulsive distemper returning, acted the like Tragedy as before: and after this manner, he would have five or six of these kind of convulsive fits, within three hours space. In the midst of one of these fits, a vein in his Arm being opened, and a large orifice made, the blood flowed out slowly, and was seen presently to be congealed: and so indeed, that being received into the dish, it did not flow about, after the manner of Liquors, with a plain and equal *superficies*, but like melted sewer, dropped into a cold Vessel, one drop being heaped upon another, it grew to a heap.

The reason of
the aforesaid
Case.

If this strange distemper had hapned to a Woman, it would presently have been said that it was the Mother, or Hysterical, and the cause of it would have been laid on the fault of the Womb; especially, for that the ascent of something, like a bulk, began the fit, from the bottom of the belly: But when this common solution, which most often is the mere subterfuge of Ignorance, cannot be admitted in this case, it seems most congruous to reason, to refer all these Symptoms to the evil affections of the brain and nervous Stock. For truly it may be plainly gathered, that the cause of the disease, did lie hid in the head it self, by the Symptoms preceding the fit, which did denote a very great agitation of the spirits within the head; that inflation of the brain, and heavy swimings, which constantly came just as the fit was coming upon him, the turnings of the eyes manifestly argue, that heterogeneous and explosive particles, did adhere to the spirits dwelling within the *Encephalon*, near to the beginnings of the Nerves. So that this case, comes near to the nature of the Epilepsie, excepting that the spirits within the middle of the brain, did not admit an heterogeneous Copula, nor being exploded in another place, did they tumultuously break forth there; for during the fit, the sick Person was still in his senses, or had the use of his memory: But the morbid matter, being more plentifully laid up in the head, when from thence it was slid, more deeply into the pipes, both of the Interior and Exterior Nerves, it had placed mines of Explosive seeds, very diffusive in the *viscera*, both of the lower and middle belly, and also in the exterior members, so that when the animal spirits began to be exploded, near the beginnings of the nerves, presently from thence others inhabiting the mesenteric enfoldings, and then others in the other nervous enfoldings, interjected from the outmost bound, even to the head, being exploded in order, did even continue the Convulsions, from one part to another, until they came to the head it self: but presently the explosion being translated from thence, to the spirits dwelling in the spinal marrow and Appending Nerves, the most strong Convulsions of the muscles and members of the whole body followed: But that, that ascent, as it were of bulk, or substance which very often was perceived in the lower belly, about the beginning of the Convulsions, proceeding from the spirits, within the mesenteric enfoldings, being brought into explosions, shall be more largely declared anon, when we come to treat of hysterick passions.

In the mean time if it be asked for what reason that the convulsive paroxysm, beginning in the part of the head, near the beginnings of the Nerves, presently the spirits dwelling in the outmost parts (as many as are predisposed for that Symptom) enter into explosions, and so transfer the convulsive Distemper, being there fully raised upwards, (for it is for the most part so, whether the entrance of the disease begins in the bottom of the belly, or about the middle of the abdomen, the *Hypochondria* or *Præcordia*, for that the Convulsion is wont to creep by degrees from those places towards the head:) I say, for the solution of this, these two considerations are offer'd, to wit, in the first place we consider, that when some whole series of spirits is disturbed, those

Wherefore the
Convulsions
begin from the
extremities of
the Nerves.

who

who reside in the extreamest bounds are first destituted of their original Influence ; wherefore they, before others, grow tumultuous, and begin to grow irregular ; hence it is, when the Nerve of the arm or thigh, is strained hard, by leaning on it, that the wonted Influence is hindred, that a numbness, with a sense of pricking or tingling, is first felt in the fingers or toes ; from whence by degrees, it creeps upwards towards the places affected. Secondly, the other is, and rather the reason of this distemper, to wit, that the spirits being ready for explosions, when they are contained within the nervous pipes, one or more, as so many distinct little Tubes, they require a sufficient ample space, in which they may be able very much, and indeed successively to be rarified and expanded, which thing because it cannot be easily performed within the Trunks of the Nerves, from the beginning towards the end, therefore while the Spirits, about the nervous origine, being first struck off, leap back towards the *Encephaleon*, for that cause they stir up the vertigo : the more open explosion of the spirits, for the most part, begins about the inferior passages of the nerves, or at their extremities, where the trunk of the nerve is either dilated into more ample foldings, or terminated in more fibres largely dispersed abroad ; then those Spirits being exploded, there is room made presently for others succeeding in order, whereby in like manner they may be exploded : Hence we may observe whilst the exterior Spirits are exploded, if a ligature or hard compression being made, the succession of others into the same space or their progress toward the exterior parts be intercepted, the Convulsion is wont to be hindred, that it cannot ascend upwards, wherefore when a numbness (as medical Histories testify) being arisen from the farthest end of the finger or toe, creeps to the superior parts, with a ringling, or like a cold air, and at length reaching the brain, causes most horrid Convulsions ; if by and by after the motion is begun, the Arm or Thigh be strongly tied, the Spasm or Convulsion not being able to get over the bound place, is hindred from coming to the head ; yea, it is usual for hysterical women, as soon as the swelling of the belly, or the ascent of the bulk in the abdomen is first perceived, to gird strongly their waists with Swathing bands, and so oftentimes they prevent the *Præcordia*, and the region of the brain, from being disturbed by that same Convulsive Fit.

But that the blood being let out in the midst of the fit, was so soon congealed, indeed it very ordinarily happens to be so in Convulsive and Apoplectical Distempers, as the most learned *Heighmore* hath first noted out of *Hendochius* : But that some from hence contend, that convulsions rely altogether upon the thickness of the blood, and stagnation, its motion being hindred, cannot be granted : because the blood taken from those who are subject to convulsions, a little before the fit, is dilated with *serum*, and fluid enough : wherefore we may lawfully think, that the congelation is caused by the *paroxysm* itself, because in Convulsive motions, and immoderate contractions of the Nerves, and *Viscera*, the interflowing blood by the exhalations of its spirit and *serum*, is somewhat loosened in its mixtion, and therefore in some sort coagulated ; like as when milk, by reason of too much agitation and separation of the parts one from another, grows into butter ; wherefore this kind of Coagulation of the blood, seems rather to be the effect, than the cause of the Convulsions.

Wherefore the blood is soon congealed in Convulsive distempers.

The Curatory Method.

AS to the cure of these kind of Convulsive Distempers, which in women, or men, proceed from the morbid cause lying upon the beginnings of the Nerves. The first indication will be, to draw away the tinder or inkindling of the disease, viz. to hinder that the blood may not affix on the head, the heterogeneous particles, either begot in itself, or received elsewhere from the *Viscera*. For this purpose an evacuation both by catharticks, and blood-letting, unless something contradict, is wont to be beneficially prescribed.

Vomiting most often brings help, wherefore Emeticks of the Infusion of *Crocus me-* *Emeticks.* *tallorum*, or of the Salt of *Vitriol*, or wine of *squills*, is to be taken at the beginning. Then almost the next day, the taking away of Blood, either by *phlebotomy* in the Arm, or by *Leeches* in the *Sedal* veins, is to be performed ; then afterwards a gentle purge of pills, or solutive *Apozems*, is to be ordained and timely repeated.

Take of the pills of the *Amber* of *Craio*, or of the *Tartar* of *Bontius* 3 ii. of the *Re-* *Purges.* *sine* of *Jalap*, gr. xvi. of *Caster* ʒ i. of the oyl of *Rosemary* or *Amber*, ʒ ʒ. of *gumm-Am-* *moniac* dissolved in hysterical water, what will suffice to make 16. pills. Let 4. of them be taken every sixth or seventh day.

Take of the *Roots of Polypodia* of the Oak, of *sharp pointed-docks* prepared, of *Cheer-vil*, each 3 vi. of the *male Pæony*, 3 iii. of the leaves of *Betony*, *Germander*, *Chamipits*, *Vervine*, the *male Betony*, each i. handful, of the seeds of *Cardamums*, and *burdock* each 3 iii. let them be boiled in 4. pints of Spring water, till half be consumed: Let it be strained into a matrace, to which put of the leaves of the best *Senna*, one ounce, of *Rhubarb*, 3 vi. of *Turbith* gummed half an ounce, of *Epithimum*, of *yellow-Sanders*, each 3 ii. of the *Salt of worm wood*, and *Scurvy-grass*, each 3 i. the yellow rine of the *Orange* 3 ii. let them digest close shut, in hot sand for 12 hours, let the straining be kept for use, sweeten it (if there be need) with what will suffice, of the *Augustan Syrrup*, or of *Succory* with *Rhubarb*. The Dose six ounces, once or twice in a week.

Remedies for a
more hot tem-
perament.

Every day, in which purges are not taken, Remedies strengthening the brain, and also the animal spirits; for the taking away the *Heterogeneous Copula*, or for the hindring them from running into explosions, are to be administred, which indeed ought to be prescribed and chosen according to the constitution and habit of the Body, and temperament of the sick; for too lean bodies, and such as being indued with a more hot blood, Medicines less hot, and which do not trouble the blood above measure, ought to be given: On the contrary, for phlegmatick and fat people, whose Urine is thin and watery, and whose blood is circulated more heavily, and *Viscera's* stuffed, more hot Remedies, and notably apt to ferment the humors, are designed. In the former case let it be prescribed after this manner.

Coroborating
medicines and
specificks.

Take of the *Conserve of the Flowers of Betony*, *Tamarisk*, the *Male Pæony*, each two Ounces, of the *Species of Diamargarit frigida* a Dram and a half, of the *Powder of the Root of Pæony*, and of the *Seeds of the same*, each one Dram, of *red Coral* prepared two Drams, of *Vitriol of Steel* two Scruples, of the *Salt of Wormwood* two Drams, with what will suffice of the juice of *Oranges*, make an *Electuary*, take of it twice or thrice in a day, drinking after it a little draught of the *Julup* hereafter prescribed.

Powders.

Take of *Coral red*, with the juice of *Oranges*, beaten together in a Glass, or Marble mortar, and dried, half an Ounce, of the *Powder of Mistletoe of the Oak*, of the root of the *Male Pæony* two Drams, of perled Sugar three Drams, make a Powder: the Dose from a Dram to half a Dram, twice or thrice in a day.

Take of the *Species of Diamargarit frigida* two Drams, of the *Salt of Wormwood* three Drams, of the root of *Cocoe-pint* powdered one Dram, mix them, make a Powder, let it be divided into xx parts; take a Dose in the morning, and at four in the afternoon.

Distilled wa-
ters and Ju-
lups.

Take of the *Roots of Butterbur* one Ounce; dose half a Dram to a Dram twice in a day.

Take of the *Leaves of Burdock* and *Cocoe-pint* each six handfuls, let them be cut and mixed together, and so Distilled. The Dose two Drams to three, twice or thrice a day, after a Dose of *Electuary* or *Powder*.

Take of this water distilled two pints, of our *steel* prepared two drams, mix them in a Vial, let it be taken after the same manner.

Take of the simple water of *Walnuts*, and of *black Cherries* each half a pint, of *Snales* three Drams, of the Syrrup of the flowers of the *Male Pæony* two Ounces: the Dose an Ounce and a half to two, after the same manner.

Take of the *shavings of Ivory* and *Harts-horn*, each three Drams, of the roots of *Cheer-vil*, *Burdock*, *Valerian*, each half an Ounce, of the leaves of *Betony*, *Chamepits*, *Hart-tongue*, the tops of *Tamarisk*, each one handful, of the barks of *Tamarisk*, and of the *woody Nightshade*, each half an Ounce, let them be boiled in two quartars of spring water, to the consumption of the third part; add to it of *white-wine* eight Ounces, strain it into a Pitcher, to which put of the leaves of *Brook-lime*, and *Cardamine*, each one handful, make an infusion warm, and close for four hours: Let the colature be kept close in Glasses. The Dose six Ounces twice in a day; after a Dose of some solid Medicine, sometimes such an *Apozeme* may be mixed with two Drams of our *steel*, and taken in the same manner.

In the Summer time, the use of *Spaw-waters* is convenient; and for want of them, our Artificial ones may be taken.

Remedies in a
more cold tem-
perament.
Electuaries.

If that for the reasons above-recited, more hot Medicines are to be prescribed, you may proceed according to the following method.

Take of the *Conserves of Rosemary*, of the yellow of *Oranges* and *Lemons*, each two Ounces, of *Lignum-aloes*, of *yellow-sanders*, of the roots of *Snake-weed*, *Contrayerva*, *Angelica*, *Cocoe-pint*, each one Dram, of the *Vitriol of steel* (or of *steel* prepared) four Scruples, of the *Salt of Wormwood* and *Scurvy-grass*, each one Dram, with what will suffice of *candied Walnuts*, make an *Electuary*; let it be taken twice in a day, to the quantity of a Nutmeg, drinking after it a dose of appropriate Liqueur.

Take

Take of the *Roots of Male Pæony, Angellica, and red Coral* prepared, each two drams, *Tablets.* of *Sugar* dissolved in water of *Snales*, boiled to the consistency of *Tablets*, six Ounces, of the *Oil of Amber* lightly rectified half a dram, make a sufficient quantity of *Lozenges*, each weighing about half a dram, take one or two twice or thrice a day, drinking after it a dose of proper *Liquor*.

Take of the *Roots of Virginian Snake-weed, Contrayerva, Valerian*, each two drams, *Pills.* of red *Coral*, and prepared *Pearl*, each one dram, of *winteran Bark*, and of the root of *Cretian Dittany*, each one dram, of the *Vitriol of steel*, and *Salt of Wormwood*, each one dram and a half, of the extract of *Centaury* two drams, of *Ammoniacum* dissolved in *Histerical* water what will suffice, to make a pillulary mass: of which take four *Pills* in the Morning, and at four in the Afternoon.

Take of the *Spirits of harts-horn, or Sut, or humane Blood*, or of *Sal ammoniack*, what *Spirits.* will suffice, take of them from 10. to 12. drops, morning and evening, in a spoonful of *Julap*, drinking a little draught of the same after it.

Take of the *Leaves of Betony, Vervine, Sage, Lady-smocks, Cuckoe-pint, Burdock*, each *Distilld wa-* two handfulls, of *green wallnuts*, number 20. the *rinds of six Oranges*, and of 4 *Lemons*, *ters.* of *Cardamus*, and *Cubebs*, each one ounce, being cut and bruised, pour on them of whey made of *Cider* or *white wine*, six pints, let them be distilled according to Art. The dose two ounces or three twice in a day, after a dose of a solid medicine. Add to i. quart of this liquor ii. drams of our *Steel*.

Take of the *water of Snails*, and of *earth-worms*, each six ounces, *walnuts* simple four ounces, of *Radish* compound two ounces, of *white sugar* ii. ounces make a *Julap*. The dose 4. or 6. spoonfulls, twice in a day, after a dose of a solid medicine.

Take of *millipedes* or *cheeslogs*, cleansed, i pint; of *Cloves* cut, half an ounce, put to them i. quart of *white-wine*, let them be distilled in a glass-cucurbit. The dose one ounce to an ounce and a half, twice in a day.

For poor people, medicines easie to be prepared, may be prescribed after this manner.

Take of the *Conservees* of the *Leaves of Rue*, made with an equal part of *sugar*, six ounces; take of it the quantity of a *nutmeg*, twice in a day, drinking after it of the decoction of the *Seeds and Roots of Burdock*, in *whey* or *posset-drink* made of *whitewine*.

Or there may be prepared a *Conserve* of the *leaves of the Tree of Life*, with an equal part of *Sugar*: dose 3℥. to 3 i. twice in a day.

Take of *millipeds* prepared 3 iiii, of *ameos seeds* 3 i. make a powder, divide it into 10. parts, take a dose twice in a day, or 12 *Sows* or *Woodlice* bruised, and *whitewine* put to them, let the juice be wrung out, make a draught, let it be taken twice a day.

In the mean time, while these Medicines are taken inwardly, it is sometimes convenient to raise blisters, with *Vesicatories*, in the nape of the neck, and behind the ears; for so the serous and sharp humors, are very much brought away from the head: besides sneezing powders, and such as purge Rheume from the head, often give signal help. The taking away of blood from the sedal veins, or the foot, ought sometimes to be iterated; yea, and the Distemper urging, Plaisters or Cataplasms, are profitably applied to the soles of the feet. It is also beneficial to apply drawing medicines about the calves and thighs.

CHAPTER VI.

Of Convulsive Motions, whose cause subsists about the extremities of the Nerves, or within the nervous foldings.

Sometimes Convulsive Distempers do arise, without any fault in the Head, by the irritation and explosion of the spirits, remaining about the extremities of the nerves, which plainly appears, because when medicines haul sharply the Ventricles or Intestines, or worms gnaw them, there do not only follow Convulsions in those parts, but besides convulsive motions do sometimes torment (or are retorted on) the members, and outward Limbs: for indeed, as we have shown elsewhere, when the sense of a very grievous Trouble torments any part, and from that is communicated to the chief sensorie, presently from thence an involuntary and irregular motion, is wont to be reflected on the spirits in that place irritated; and that not only by the same nerves, to which the sense of the pain was carried, but sometimes also the Convulsion is reciprocated by others, either neighbouring, or altogether extraneous: So the Stone being fixed in the Ure

Ureters, and irritating very much its nervous *fibres*, excites convulsive motions, not only in the distempered Vessels, but almost in all the *Viscera* of the Abdomen: So that the Urine being suppressed, Torments diffused here and there, and very often horrid Vomiting follow. Wherefore, 'tis not at all to be doubted, but that both diseases, and some Convulsive Symptoms, are very often induced, by reason of an outward hurt, brought to the Tops of the nerves, terminating within the membranes, muscles, or *Viscera*: yea in the hysterical, *hypochondriacal*, and certain other passions, if at any time Convulsive motions are excited, in the hurt head by the fault of the womb, spleen, or other inward; verily they arise by this only means, to wit, by the Trouble of the rest of the parts, being translated this way through the Nerves, (but in no wise by the Vapours) to the brain, and are propagated all about into various Regions of the Body.

Convulsions
begin from the
ends of the
Nerves, both
by reason of ir-
ritation.

But it should here be noted, that altho the evident solitary cause, forasmuch as it is strong and vehement, may sometimes induce Convulsions of it self, and without a previous disposition: beacuse indeed the Animal Spirits, irritated, beyond measure, begin greater, and more than ordinary explosions, as in overgreat purging, and Vomiting, and the fits of the Collick, and Stone, is ordinarily wont to happen; yet in many other convulsive Distempers, whose fits are often and habitual, besides the irritation made, about the extremities of the nerves, which serves for the most part for the evident cause, also a certain more remote cause is present, to whose efficacy the assault of the disease is chiefly beholden; to wit, when convulsive motions are wont to be excited, and at every turn repeated, by the fault of the Spleen, Womb, or other private part, it may be suspected, that the animal Spirits, of the *Fibres* in the distempered part, and those disposed in its neighbouring parts, had first contracted an heterogeneous, explosive *Copula*, by which being filled, to a running over, they were provoked, by a light occasion, to convulsive explosions: Then, those being first begun, about the extremities of the nerves, creep upwards by the passage of the same nerves, and are often carried to the same nervous origine, and sometimes beyond, to the middle of the brain: from whence, lastly, being reflected on the Nervous stock, they also secondarily cause the convulsions of the members and limbs: But after the brain, and a superior portion of the nervous system, are wont to suffer, and be affected often, by the convulsions below excited, the spirits inhabiting those parts, also begin to be themselves adulterated at length, and to admit an heterogeneous and explosive *Copula*, and so to acquire in part, a procatartick cause; hence at length a Convulsive procatartick, or more remote cause, becomes common to either end of the Trunk of the same nerves, and the animal spirits of one nerve, or more being evilly disposed, both at the head and tail, conceive explosions from either part, and deliver them presently to the other, as shall be more largely declared below, when we treat particularly of hysterical, and other; passions in the mean time, we will add some histories and observations of convulsions arising from the farther ends or extremities of the nerves.

And by reason
of an explosive
Copula.

1. Observation. A fine maid, about the 16th. year of her age, falling from her horse, and lighting upon a Stone, grievously hurt her left breast, from whence a Tumor arose, with pain, which Symptoms notwithstanding by the use of Medicines, at the beginning seemed to be mitigated, and to be indifferently well, for a long time after. Three years after, she having taken cold, and having observed but a bad course of dyet, all things began to be exasperated, the hurt part swelling into a bigger bulk, troubled her with an acute, and almost continual pain, that the sick Virgin, for the cruel torment, could take no rest for many days and nights, neither could she suffer the *glandula's* of her breast, being then made more tumid, to be either touched or handled; yea nor any noise, or shaking to be made in the Chamber.

When to this Tumour, about to degenerate into a Cancer, they had applied fomentations, and Cataplasms of *hemlock* and *mandraks*, and other stupifying and repercussing things, this gentlewoman began to suffer certain Convulsive affections infesting her very often: At first, as often as the pain in her breast did most cruelly torment her, she felt in that place, prickings, also convulsions, and contractions, running about here and there, then presently her *Ventricle* and *Hypochondria*, and often the whole *Abdomen*, were wont to be inflated, and very much distended, with an endeavour of belching and vomiting; by and by, the same distemper, being leisurely translated to the superior parts, excited Insensibility; to which shortly after, convulsive motions succeeded, in the whole Body, so strongly, that the sick party could scarce be held by three or four strong men.

These kind of fits, at first were wandering, and only occasionally excited: to wit, they would come, as often as the pain of her breast was strained, by some evident cause: Afterwards, these convulsions did more often infest her, and at last, they became habitual, and periodical, twice in a day, to wit, they were wont to come again constantly, at so many set hours after eating: And when after this manner, the sick Gentlewoman had

been

been miserably afflicted, for six moneths, at length, she began to be molested with a vertiginous Distemper of her head, exercising her almost continually: for which evil when a fomentation of aromatick and cephalick herbs, had been a good while administered to her head, she became better, as to the giddiness; but then she was perpetually infested with a quite new, and admirable Symptom, *viz.* an empty cough, without spitting, night and day, unless when she was overwhelmed with sleep: After this worthy Virgin, had tryed without much benefit, divers medicines and remedies, prescribed by several Physicians, she was at last helped by making use of the most temperate Bath, at the Bath; then being presently married, after she had conceived, and was brought to bed, she by degrees grew well.

If the reasons of the whole disease, and its accidents, be inquired into, without doubt the convulsive distemper was first of all excited from the tumor or pained place of the breast; the cause of which was partly the most sharp sense of pain, being impressed from its fibres and nervous parts, but partly by the heterogeneous Copula, being affixed on the spirits inhabiting those fibres and Nerves; for truly, it may be suspected, that the most sharp humor impacted in the Tumor, which perhaps had in some sort flowed thither by the passages of the Nerves, being reperculated by the use of Topicks, had entered the Fibres and Nervous filaments, or little strings disposed thorow the whole border or neighbourhood, and so the heterogeneous and explosive Copula, had clove to the spirits; for the shaking off of which, as often as by pain they were excited, they entered into Convulsive explosions, and together with them, other spirits flowing within the neighbouring Nerves, by consent of the forms (as it often happens) were exploded after the same manner: Then the Convulsive Distemper, when it first had begun in the extremities of the Nerves, being continued thorow their passages, even to the head, was wont to cause the insensibleness; and from thence leaping back upon the whole nervous system, the Convulsive motions of the Limbs and all the members: The fits, about the beginning of the sickness, being excited after this manner, by reason of pain from the distemper'd part, were carried secondarily to the brain and its appendix: But afterwards, when the spirits inhabiting those places, being often exploded, by sympathy, had so loosened, and weakened the pores of the containing parts, that there lay open a passage within the same, for all Heterogeneous Particles to enter, with the nervous juice, the Convulsive *procatarxis* or more remote cause also increased in the head; and the spirits inhabiting the *Encephalon*, being infested with an heterogeneous Copula, they themselves begun the Convulsive fit, or at least afforded the first instinct to its assault, which did return, for the most part, at such set hours after eating, because the morbid matter was carried in, together with the nervous juice, almost in an equal dimension: In truth, in such cases, where the Convulsion being general, doth possess almost all the parts of the whole nervous system successively, we may suspect, that the animal spirits had contracted an heterogeneous and explosive Copula, in the whole nervous stock, which, when it is arisen, at the set time, to a fulness, incites the spirits themselves at the appointed time, in like manner, to explosions, and the same explosion being begun somewhere, is propagated in order to all, after the manner of a fiery enkindling.

As to that empty cough, which succeeding the fomentation of the head, exercised this sick person almost incessantly for many months; it seems, that this symptom should depend altogether from the nervous origine being distemper'd, and not at all on the stuffing of the Lungs; for she did not avoid any thing with the cough; and if at any time that force of coughing was violently restrained, presently she was troubled with the Sense of choaking in her Throat: So that, as it is very likely, the morbid matter laid up near the nervous origine being rarified and stirred, by the fomentation, entered more deeply the heads of the Nerves, appointed for the Lungs, and stirred up in their fibres and filaments, perpetual convulsions: after the like manner, as when the Nervous juice, which waters the fibres and tendons of the Muscles, being made sharp and degenerate, induces to those parts continual leapings and contractions: hence, when a Convulsion or Spasm was stop'd, in some branches of the distempered Nerves, so as she could not cough, presently the Convulsive motion, running into other branches of the same neighbour Nerve, stirred up that choaking in the Throat. I will here propose another example of a Convulsion, arising from the extremities of the Nerves being affected.

A Noble Matron, of fifty years of Age, after her Courses had left her for about half a year, began to complain, first in a pricking pain of her left Pap; then afterwards, that Distemper leaving her, she was ill about her Ventricle, for there arose an hard, and as it were a schirrous tumour, with a sad pain; upon this came an inflation of the stomach, with difficulty of respiration, a nausea, and frequent Vomiting: Then

The reason
of this.

2. Observation.

Then the disease encreasing, with a more sharp pain running about here and there, she fell into Convulsive Distempers of the Ventricle: to wit, in that place, she was almost continually troubled with Convulsions variously running about, just as if her ventricle had been torn to pieces: Besides a constant perturbation of mind, with thirst, and watchings, and a frequent *deliquium* of spirits, as if she had been just dying, exercising this sick Lady: All which symptoms, she plainly perceiv'd to arise from that Tumour in her ventricle: They saw that all vomitory, cathartical, antiscorbutical, and hysterical Medicines, did her no good, but were rather hurtful and troublesome; she received some benefit, by the taking away of blood by Leeches, and by the use of Asses Milk, and afterwards she was much eased by the drinking of Spaw waters.

The reason
of it.

The aforesaid symptoms, which commonly are ascribed to the hysterical passion, and the vapours from the Womb here plainly appear, to have proceeded from a Tumour, arising about the bottom of the Ventricle: for that the blood of this Lady being very hot and melancholick, when it could be no more purged by her Courses flowing from her, it laid up its recrements, and adust *feculencies*, at first in her Breast, and then from a new beginning in the Membranes of her Stomach: From the tumor there made, sharp and Heterogeneous Particles falling down perpetually, entred the *fibres* and nerves planted round about; which cleaving continually to the spirits dwelling in, and flowing into those parts, excited them to frequent explosions, and so made Convulsive distempers in all the neighbouring parts: But that sometimes the Convulsive motions were more light in that place; hence it appears, that the whole nervous stock, and the head it self (as is wont to be in greater Convulsions) had not as yet been touched with the same distemper: But the disorder of spirits arising about the parts affected, and from thence transfer'd by a smaller undulation or waving to the head, and so only lightly disturbing the spirits inhabiting it, induced watchings, with a great heat, and perturbation of the phantasia. What we have hitherto discoursed of Convulsions, from the morbid cause settling upon either end of the nervous system, will more clearly appear, when we shall hereafter treat particularly of the chief kinds of Convulsions, *viz.* the Hysterical, hypochondriacal, and other passions: In the mean time, there will be no need to add a Curatory method, for this *Hypothesis* of Convulsions, arising by reason of the extremities of the Nerves being affected, because the ways of curing may be better accommodated to the Passions of this kind, hereafter particularly to be spoken of: But for the present, it behoves us, to proceed to the unfolding of the Convulsive passions, whose cause, or morbidick matter, seems to subsist within the nervous foldings.

That the nervous foldings
is the seat of
Convulsive
matter.

We have largely enough, in another place, discoursed of the nervous foldings, and in their description and use we have shown, that 'tis very likely, the more grievous fits of Convulsive motions, beginning oftentimes within these parts, are from thence propagated on every side, into the neighbouring parts, and not seldom to a great distance: at least, that it seems much more probable, that the Heterogeneous and explosive particles, after they have overcome the tract of the head, and its medullary *appendix*, and being more deeply flidden into the Channels of the Nerves, and their passages, together with the juice watering them, do spread their stores within the nervous foldings, as it were in Cross-streets, and by-paths, and there sometimes make their stations, until at length, being more plentifully heaped up, they as it were with collected forces, produce the more cruel Convulsive distempers: This I say, appears to be much more probable than (what is commonly said) to suppose them vapours, arising from the Womb, Spleen, Ventricle, or any other inward, in which all the fault is easily thrown: For within these foldings there are spaces large enough for morbidic mines, that the matter may be there at leisure laid up, and remain, till it be gathered to a fulness: But then, because we believe, that great plenty of spirits lodge there, more than in any other little Cells, the heterogeneous *Copula* growing to them, lays as it were tinder for more grievous explosions, so that the spirits being exploded within these bodies, do not only inflame, and dilate them, but elevate and lift them up from their place, (even as a house blown up with Gun-powder;) wherefore the parts lying over them, are suddenly lifted up into a tumor, and loose, are drawn violently hither and thither. That after this manner, the more cruel fits of Convulsions, about the *Præcordia* and *Viscera*, are very often stirred up, I have found to be true, besides the Arguments taken from reason, not long since by my own sight: For when I opened the dead body of a Gentlewoman who had been exceedingly troubled with (as they say) the Mother fits, or hysterical Distempers, I found the Womb wholly faultless, but the Nerves near the foldings of the *Mesentery*, (as it seem'd) only to be lifted up, and elevated into a bulk, and the Membranes of that inward, appeared torn, and loosened one from another, as being on every side tumid and loose, as it were blown up into little bubbles or bladders.

Indeed

Indeed there are more considerations of solid reasons, whereby we are induced to believe, that the passions called hysterical, do most often arise from the convulsive matter heaped up within the *Mesenterick* enfoldings, and by turns exploded: which shall be more clearly manifested, where we treat especially of those diseases. But, neither is it less probable, that the Collick-pains, do very often proceed from a more sharp and irritative matter, contained in the same enfoldings. Besides, as often as the convulsive fits seem to begin from the spleen or ventricle: by reason the beginnings of which are inflations, and very great disturbances of those parts, it is likely, that the nest of the convulsive matter, was hid within the nervous enfoldings, belonging to the spleen or ventricle: Also this kind of matter seems to excite within the Cardiac foldings most heavy tremblings, and passions of the heart; and within the pneumonic or cervical, (or those belonging to the Lungs and Throat) enfoldings, most terrible fits of the Asthma. In our Treatise of the Nerves, we have related a notable case, of a worthy Gentlewoman, to whom a serous matter, wanted to distill from the forepart of her head through her left nostril, fell behind her ear: where when the most cruel pain did infect her, Convulsions also, and admirable contractions followed: whereby the joining or compaction, now of the brain, and the whole head seemed to be pulled downward, now the throat, *præcordia* and *Viscera* upwards: which kind of Convulsions vexing the parts so opposite, and at such distance by turns, when they did proceed from one and the same seat of the disease, planted in the midst, it will be obvious to conceive, that the grieved place, as the origine of either convulsive affection was the ganglioform enfoldings, planted near the *Parotidæ* or the two chief *Arteries* of the throat: into which the Nerves both of the wandering pair descending from the head are entred, and out of which the shoots do stretch themselves, into the muscles of the throat and branches into the *præcordia*, and *viscera*. Further from the same cause, to wit, the convulsive matter heaped up, and by turns exploded, within the ganglioform enfoldings, we think, (and not undeservedly) that sense of choaking in the Throat, so often excited in the convulsive fits, did proceed. But there will be a more fit place, to speak of this, when we shall particularly handle the convulsive diseases and symptoms. We shall now endeavour to search into what remains, of the last kind of Convulsions, of which we made mention above, to wit, which relies on the nervous Liquor being infected thorow its whole mass, with heterogeneous and explosive particles, and for that reason, irritating the whole processes of the Nerves, and the nervous bodies, into universal Spasms, or Convulsions; and those either continual, or intermitting.

CHAPTER VII.

Of Convulsive Motions, arising from the Liquor watering the nervous Bodies, and irritating their whole processes into Convulsions.

THAT Convulsive distempers do sometimes wander thorow the whole nervous stock, and infect now these parts, now those, now many together, is so noted, and obvious almost to daily experience, that nothing can be more: we may therefore take notice in these, that the tendons of the Muscles do every where leap up, and are drawn together with spasms; in others, some exterior members are bended or stretched forth, with various flexions, and contortions, here and there, after divers manners; we have seen some forced by the unbridled and untamed force of the spirits, as if struck with madness to run or leap about, or strongly to smite, with their feet, or fists, the earth or any objects: which if they should not do, forthwith they would fall into swooning fits, and horrid Eclipse of spirits. It would be too tedious, to enumerate all the cases of universal Convulsions, wandering thorow the whole nervous stock: But the symptoms of this kind, tho they are various and manifold, may be reduced nevertheless to three chief heads; to wit, forasmuch as they depend chiefly upon three kinds of causes; for indeed in these wandering Convulsions we ought to suppose the whole nervous Liquor to be vitiated, and the animal spirits, flowing every where in the same to be adulterated, and for that reason, to be almost perpetually exploded: Take notice then, that this kind of infection is most commonly impressed on the nervous juice,

Chiefly three kinds of causes of universal Convulsions.

juice, and the spirits every where flowing in it, by one of these three ways, viz. 1st. By Poysons or Witchcraft. 2dly, From malignant or ill-cured fevers, in which the morbid matter is poured forth on the Brain, or nervous stock. Or 3dly, When the nervous Liquor, by a long tract of time, by reason of the scorbutic, or otherwise vicious distemper, doth degenerate from its due constitution into sour, or acid, or any otherwise præternatural and Convulsive Liquor: we will here consider of each of the aforesaid cases, and first of all, of the fits of Convulsion, which are produced by poysons or Sorceries.

From poysons
and sorceries.

From poysons
of the rank of
vegetables.

From a mad
Dog.

First therefore, it is somewhere shown by us, that some poysons do act rather on the nervous Liquor, than on the blood, which depraving it most strongly, induce Convulsive distempers: And it appears clearly, from the eating of *Hemlock*, the *laughing Parsly*, *man-drakes*, the furious *nightshade*, *wild Parsnips*, and other hurtful herbs, how soon after horrid Contractions of the *Ventricle*, *numbness*, *delirium*, Convulsions, twitches of the *tendons*, in the whole body, were wont to follow. Besides, those kind of Convulsions follow upon the biting of a mad Dog, and other venomous beasts, where the virulent infection, being received by the nervous juice, and lurking a long while in it, at last puts it self forth, and infects and poysons the whole mass of Liquor, in which it was involved, with its ferment. But what doth yet more illustrate it, are the admirable Symptoms, the truly painful Convulsions, and unweariable dancing, which Authors have related to follow, upon the biting of the *Tarantula*; and indeed, might seem fabulous, unless that the truth of the Thing were asserted by many men of good Credit, both ancient and modern: For besides *Mathiolus* and *Epiphanus*, *Ferdinand*, *Gassendus*, and *Kirchir*, add, that themselves were eye-witnesses of this distemper: yea it is said, 'tis a known thing in *Apulia*, and found almost by daily experience, that in that part of the Country, there are *Phalangii*, or a certain kind of Spider, which is called *Tarantula*, from *Tarenta* an ancient City of *Apulia*. This little Animal, being very frequent in the summer, often bites the heedless Countryman, and infects him with its Venomous Stroke, from whence presently succeed a pain in the hurt part, with a Tumor and itching, and by and by in various parts of the body, a numbness, and trembling, also Convulsions, and loosnings of the members, and other Convulsive Symptoms, with a great loss of strength; as may be collected from *Mathiolus*, *Ferdinand*, and others, relating the wonderful effects of this Disease. But truly, what these Authors say concerning the cure of this Distemper, and is practised commonly thorow the whole country, is worthy of great admiration: for these stung with a *Tarantula*, as very sick as they are, as soon as they hear musical Instruments, presently they are eased of their pains, and leaping into the middle of the room they begin to dance, and jump about, and so continue it a long while, as if they were well, and ailed nothing; but if it happen, that the Fiddlers leave off never so little a while, they straitways fall to the ground, and return to their former pains, unless by the incessant musick, they dance, and leap till the poyson be wholly shaken off: For this end therefore, Musitianers are hired, and are changed by turns, that without intermission of the noise, those who are bitten, may dance so long till they are quite cured. Thus saith *Mathiolus*; To which *Ferdinand* adds, that poor people do expend almost all their substance, in these fiddlers and musitians, who wander up and down all that Province; and by playing to these *Tarantula*-sized people, make much benefit: they dance or leap about in the villages and publick streets, and fields, some one day, some one week, and others more. To these Authors, the most learned men, *Gassendus* and *Kircherus* agree, both of which have related it from their own Observation, that they have known such affected; and they assert, that they are not affected or excited indifferently with any musick, but with certain kinds of Tune, and that they dance to some measures before others.

The reason of
the symptoms
of those bitten
by a *Tarantula*.

Let us inquire a little further into the reasons of the aforesaid Accidents, if we may follow our conjecture, in this first place, 'tis without doubt, that a certain venomous infection is fixed on the humane body, from the bite of this little creature, which tho it being less infectious to the blood and vital spirit, as soon as ever it passes from it into the nervous Liquor, it presently unfolds it self thorow its whole Mass like leaven, and infects the animal spirits, flowing every where in it; so that indeed, they being drawn one from another, and here and there inordinately moved, induce convulsive distempers, which are accompanied now with the contractures, now with the languishing, and resolutions or loosening of the containing parts.

In what the
reason of the
Musicks allay-
ing the symp-
toms con-
sists.

But why the painful Convulsions, which are raised by the bite of the *Tarantula*, being presently allayed by musick, are wont to turn into dancing, does not so plainly appear. That some affirm this little animal (for that by the testimony of *Aristotle* it should be most wise) to be delighted with musick, and for that reason, its venom being

impressed on man, by fermenting the humors, to induce the like love of musick : I say, this conjecture will not satisfy a mind desirous of Truth, because, that supposes a musick loving nature in the spider, and the same to be communicated to man, by a *metastasis*, or as it were a certain *metempsychosis*, or transmigration of soul, both which are taken upon trust, and little satisfactory ; but it may be rather said, that the venom inflicted on the nervous liquor, by the bite of the *Tarantula*, is too gentle to be able to extinguish wholly the Animal spirits, or to dissipate them very much asunder, and to compel them into more cruel explosions, but only to put them to flight, and to incite those flying here and there, into lighter, and somewhat painful Convulsions; and that the Musick with its flattering sweetness, doth congregate together, and mutually associate with ease the spirits so dissipated ; wherefore, whenas the same spirits, by reason of the Infection sticking to them, are apt to involuntary and Convulsive motions, the melody disposes them, delighted together, and directs them to such Convulsions, that entering the bodies of the nerves, by a certain Course and Order, they are carried as it were in certain prescribed limits and compasses, until at length the particles of the venom, being quite evaporated, and the fury and rage of the spirits being worn out, they wholly shake off that madness. For truly, musick doth easily carry men sound and sober, whether they will or no, or thinking of another thing, into actions answerable to the sound of the harmony ; that presently the standers by, at the first striking up of the fiddle, begin to move their hands and feet, and can scarce, nay are not able to contain themselves from dancing : Let none therefore wonder, that in men bitten by the *Tarantula*, when the animal spirits being moved, as it were with goads, they are compelled to leap forth, and wander about hither and thither willingly, if they are excited to dancing and composed measures, at the stroke of an harp, so that as in these distempers, the spirit of the musick, as it were enchanting the outrageous spirits, and in some measure governing, and changing their convulsive motions, serves instead of an Antidote : for that the animal spirits, being very much, and for a long while exercised, after this manner, wholly shake off the Elastic *Copula*, contracted by the poyson, or otherwise ; and they being very much wearied, at length rest from that madness, or its incitation.

That which is called the *Dance of St. Vitus*, is an evil akin to this, concerning which George Horstius relates, that he had spoken with some women, who for some years, visiting the shrine of *St. Vitus*, which is in the borders of *Ulme*, did there exercise themselves even night and day, with dancing and discomposure of mind, till they fell down like people intranced : by which means, they seemed to be restored to themselves, that they felt little or nothing for a whole year, till about the time of *May* following, when by the inquietude of their members, they said, they were so far tormented, that they were forced to go for their health sake yearly to the, aforesaid place, about the feast of *St. Vitus*. Horst. Epif. Med. Sect. 7. de admirandis Convulsionibus.

A description
of the dance
of St. Vitus.

Indeed it is a usual thing (as I have observed) both for men and women, to be sometimes tormented with this inquietude of their members, and as it were with a fury, or madness, that they have been forced to walk, till they were tired, as also, to dance, leap, and run about, here and there, that by this means they might shun the grievous trouble, and sometimes faintings away, which were about to invade them : The reason of which seems to be, that the animal spirits, forasmuch as they being incited by an heterogeneous *Copula*, in the whole nervous kind, become fierce, and altogether unbridled, which to exercise and tire out, there is need, both that they themselves may be tamed, and that the explosive *Copula* may be shaken off.

The reason of
it.

That Convulsive distempers are sometimes excited by witchcraft, is both commonly believed and usually affirmed by many Authors worthy of Credit : and indeed, as we do grant, that very oftentimes most admirable passions are produced in the humane body by the delusions of the Devil, forasmuch as he, to cause wonders, by which he might rule, by the subtlety of working, insinuates to the sensitive soul, or the constitution of the animal spirits, heterogeneous Atoms or little Bodies, and so adds now spurs or pricking forward, and now casts chains on its functions, and now carries them to mischief; also by some means he enters himself into the humane body, and as it were another more mighty soul, is stretched thorow it, actuates all the parts and members, inspires them with an unwonted force, and governs them at his pleasure; and incites to the perpetrating of most cruel and supernatural wickednesses: yet all kind of convulsions, which besides the common manner of this disease, appear prodigious, ought not presently to be attributed to the enchantments of Witches, nor is the Devil presently or always to be brought upon the stage. For indeed as often as a child, or relation of some man of the richer sort is by chance taken with most cruel and unusual Convulsions, for the most part it falls out, that by and by the next old Woman

Universal Con-
vulsions from
Witchcraft.

Which are
commonly but
falsely so
thought.

The reason
of them.

Which argue
witchcraft.

is accused of Witchcraft, she is made guilty, and very hardly, or not at all, the wretch escapes the flames, or an halter; when in the mean time, the Disease proceeding from causes meerly natural, may be easily cured, by no other Exorcism, than Remedies usually prescribed against Convulsive Diseases: In truth, the animal spirits being indued with a more cruel explosive *Copula*, and being stricken by it all of a heap together, obtain so much strength and vigour, beyond their proper and wonted power, as the flame of Gun-powder has above the burning of the common flame; so that those who obnoxious to this Disease, out of the fit may be govern'd, lifted up, and moved at pleasure, with the light help of one man; when the same is upon them, make nothing of the utmost endeavours and force of at least four of the strongest men: But if in the case of any one that is sick, there arise a suspicion of Witchcraft, or Fascination, there are chiefly two kinds of motions that are wont to create and cherish this opinion, *viz.* 1. If the Patient doth perform the contortions or gesticulations of his members, or of his whole body, after that manner, which no sound man, nor mimick, or any tumbler can imitate. Then, Secondly, If such strength be shown, that surpasses all human force; to which, if the avoiding of monstrous things happen, as when bundles, as *Henry van Heers* relates, are cast forth by Vomit; or a live Eel, as *Cornelius Gamma* tells, voided by Stool, without doubt it may be believed that the Devil has, and doth perform his parts in this Tragedy.

It were easie to heap together very many, and indeed admirable Histories of persons of every Age and Sex, affected after a stupendious, and as it were supernatural manner, with the manifest suspicion of Witchcraft: for such are every where extant among Authors, both Physicians', and Philosophers; and because vulgar rumor noises about Diseases caused by Witchcraft, to happen often in almost every Country: but because these kind of cases are full of Imposture, or always increased by the fictitious lies of the relators, to create admiration (and for that they rarely fall under the medical cure) I will here purposely omit them: what remains is, That I proceed to unfold the next kind of universal Convulsions, to wit, which comes upon malignant, or otherwise irregular or ill-cured Fevers.

CHAPTER VIII.

Of Universal Convulsions, which are wont to be excited in Malignant, ill-cured, and some irregular Fevers.

Universal
Convulsions
happning in
Fever.

The reason of
the symptoms.

THAT Convulsions sometimes happen to persons sick of Fevers, almost every ordinary body understands, and from thence takes a remarkable Prognostication of death, or peril: For in malignant Fevers, also sometimes in the ordinary ill-handled, as the *Virago*, or *Delirium*, arise from the morbid matter being laid up in the Brain, from the Blood; so from the same, being slid down into the Nervous stock, contractions and twitches of the Muscles and Tendons; also sudden shakings of the Members and Limbs; and sometimes most horrid stiffnesses in the whole Body succeed: The reason of which kind of symptoms seems to consist in this, that the Liquor watering the Nervous parts, abounds every where with heterogeneous Particles irritating the spirits: for by that means the spirits inhabiting and influencing, being disturbed in their just influence and emanation, are incited into continual explosions, as it were a crackling noise, not much unlike, as when the flame of a Lamp being imbued with drossy and salted Oil, ascends with a noise and sparkling: which kind of Convulsive Distempers, for the most part, happen about the height of Fevers, when the morbid matter being first laid up in the blood, is from thence transfer'd to the brain; and that being pass'd thorow, and also infected, it is carried into the system of the Nerves, and from thence stirs up Convulsive passions, with or without a *Delirium*.

But indeed, it is sometimes observ'd, That besides these kind of Convulsive Distempers, coming upon Fevers, and secondarily excited; in a malignant constitution of the Air, also from the Breath of a Pestilent Contagion, the Nervous Liquor hath been infected before the blood, or else apart from it; and therefore a *Delirium*, or Convulsions, have gone before a Feverish Distemper. Further, I have often observed, That some irregular Fevers have arose, in which the blood has been hardly seen to boil up, or grow hot above measure, but the beginnings of this slow and very dangerous

gerous Fever, were laid chiefly in the nervous humour; which being by degrees brought to maturity, did induce Convulsive Distempers, with a *Delirium*, or madness, and other wastings or exorbitances of the Animal Spirits. For the sick never complained of heat, or thirst, being soon made feeble, and as it were strengthless, they were presently obnoxious to frequent giddiness, also to tremblings of the Limbs, and as it were leapings forth; besides, to twitches or jumpings of the Muscles and Tendons, and to contractures, and pains wandring about, here and there. This kind of sickness, by some Physicians, because it seem'd to consist in the solid parts, rather than in the blood, is called a *malignant bestick Fever*; when indeed, the same being fixed chiefly in the nervous humour, may be better called, the *Convulsive nervous Pestilence*.

There is mention made by Gregory Horstius, of a *Convulsive and malignant Disease*, which was sometime past *Epidemical*, in *Hassia, Westphalia*, and the neighbouring Countries: they being taken therewith, without a Feverish heat, immoderate effervescency of blood, whilst they were employed about their familiar occasions, hardly perceiving themselves to be sick, were wont to have about their hands or feet, and sometimes in both, a sense of tingling, with a numbness running up and down: then, by and by, their fingers, together with their Arms and Thighs, were now strictly drawn together, now most strongly stretched forth, as if they were frozen. Those kind of contractions, and extentions, rendred themselves by turns, and then changed places, that now the distemper resided in one part, then presently in another: But (as it often happened) if the Disease at once invaded the whole Brain, universal Convulsions, and oftentimes epileptical fits, infested the sick: besides, those labouring with it, were obnoxious at some turns to a *Delirium*, *Madness*, and sometimes a *Lethargie*: This sickness continued a long time, without any *Crisis*, or sound solution, and could scarcely be so perfectly cured, but that the disposition of the Brain, and nervous parts remained evil all their life after.

As to the reasons of this Disease, and symptoms, it is obvious enough, that the same depends altogether upon the vice, and notable depravation of the nervous juice. That pricking, or tingling, for the most part, at the first coming of the disease, was procured for this reason, because that Liquor, beginning to be poisoned, and loosned in its mixture, by the malignant infection, presently it oppressed the animal spirits, abounding therein, and inhibited them from their wonted and free expansion; wherefore, they being half overwhelmed, and constrained to creep, as it were, among Briers, or things that catch'd hold of them, or held them back, they excited the sense, as it were of tinglings, running about: but then, because this Disease growing worse, the nervous Liquor was yet more perverted in its *Crisis* or disposition; the Heterogeneous Particles, which were brought together in it, cleaving to the spirits, caused them to be moved hither and thither, and to be unduly exploded; for which reason, the contractions and horrid distentions in the members, and the tumults and great inordinations in the head, were raised up. But that in this Fever of the Nerves a solution or difficult *Crisis*, or none at all hapned, the reason was, because the nervous juice being slow, and as it were mucilaginous, and therefore heavy in its motion, was not defecated or cleared, as the blood, by a critical effervescency, nor easily conceived, that kind of fermentation by which the pure might be separated from the impure.

Indeed I have known a sickness, much like to this example, to be often excited in our Country, and to invade whole Families, especially Children, and the younger People. Some years since, a popular or childish Fever, very much infesting the Brain and Nervous stock, exceedingly spread in this Country, yea almost thorow all *England*: The History of which Disease, being described in that time, in which it raged, viz. in the year 1661. I think it worth our pains to insert, in this place of our *Convulsive Pathology*: For from hence, it may appear, by what means, and from what causes, the Convulsive symptoms, which come upon any Fevers, are wont to be excited.

A description of a convulsive disease of Hassia, sometimes epidemical.

The reason of the symptoms.

A Description of an Epidemical Fever chiefly infestous to the Brain and Nervous stock, spreading in the year 1661.

The History of an Epidemical Fever raging in the year 1661.

Its procacat-tick or more remote cause.

The Symptoms.

IN this Country, before the last Summer, viz. 1661. we had been free for above two years, from any popular Disease, unless such only as usually come in some places; but then, before the Summer Solstice, the *small-Pox* (a distemper here rarely Epidemical) being rise in many places, raged very much: After that Summer, which was extremely hot and dry, an Autumn moister than usual followed: and after which, a most mild Winter, almost without any cold: in all which space, the Earth was hardly covered with Snow, or was ever hard frozen, above three or four days; so that within a few weeks, after the Winter Solstice, the Trees began to bud, and the vernal Plants to break forth from the bosom of the Earth; and to flower, and also the birds to build nests: to this mild season, not eventilated at the beginning of the spring, by the nitrous little bodies that were wont to be blown from the North, a filthiness of showers, and almost continual wet succeeded. After the vernal *equinox*, a certain irregular, and unaccustomed Fever, seized upon some, here and there, which within a month became so Epidemical, that in many places it began to be called the *New Disease*; Raging chiefly among Children, and Youths; it was wont to afflict them with a long, and as it were a chronical sickness: yea sometimes, old men, and men of middle Age, though rarely, were seized by it, and those indeed, it did sooner, and more certainly kill. The Distemper at first invading any one, did creep on them so silently, that the beginnings of the sickness were scarce perceived: for arising without immoderate heat, or more sharp thirst, it induced in the whole body a great debility, with a languishing of the spirits, and a torpitude or numbness of the function; The Stomack was ready to loath any victuals, and to be grieved at any thing put into it, and yet not easie to vomit. The sick were unfit for any motion, and only lov'd to be idle, or to lie down upon the Bed: within a short time, also sometime at the first coming of the Disease, they complained of a heavy *vertigo*, a tingling of the ears, and often of a great tumult and perturbation of the brain. Whick kind of symptoms were often esteemed, as it were the peculiar sign of the approach of this Disease, if in some those had been wanting, or hapned to be more remis, instead of the head being affected after that manner, the Disease took more deep root in the Breast, with an excited Cough, as shall be told by and by. But whilst the Brain, and the Nervous *Appendix*, being after this manner affected, the animal spirits, presently from the beginning of the sickness, were benumbed, a flow, and as it were Hectick Fever, was inkindled throughout: but yet the effervescency of the blood, which was hardly continual, but sitting and uncertain, was according to the disposition of the blood it self, in some more intense, in others more remis; and therefore, thirst, the white scurf of the Tongue, and other symptoms, which accompany a feverish distemper, did more or less infest them: sweating did not willingly follow; nor could it easily, or by a light thing be caused by Art: yea, neither this, nor any other evacuation, as it were critical, at any time succeeding, did suddenly help this Disease; but it persisting for many weeks, and sometimes months, reduced the sick to the highest *Atrophie*, or wasting of all parts, and often infected them with an incurable Consumption.

About the increase of the Disease, which hapned in most within eight days, if the Distemper (as it was often wont) did settle chiefly in the head, and nervous system, most grievous symptoms, in their Dominions, viz. a plain Phrensie, or deep Stupidity, or Insensibility did molest them. For I often observed, in many Children, and not seldom in Women, after seven or eight days from their falling sick, that their knowledge and Speech failed them, and so the sick have lain, for a long while, yea, sometimes for the space of a whole month, without any taking notice of the by-standers, and with an involuntary flux of their excrements; but if they continued in some sort the use of Judgment and Reason, they laboured with a frequent *Delirium*, and constantly with absurd and incongruous *Chymera's* in their sleep. But in men, and others of a hotter temperament, from the morbid matter, instead of a *Crisis* being translated to the brain, a fury, or dangerous, and oftentimes deadly Phrensie did succeed. But if neither stupidity, nor great distraction did fall upon them, swimings in the head, Convulsive motions, with Convulsions of the members, leapings up of the *tendons*, did grievously infest them. In almost all the sick, the belly was for the most part loose, casting forth plentifully now yellow, now thin and serous excrement, with a great stink: it was rarely that vomiting fell upon any one: The urine in the whole process of the Disease,

Disease, (unless when the morbid matter being carried more plentifully into the Brain, did threaten a Phrensie) was highly red, so that some, by reason of the deep colour of the water, judg'd this Fever to have been plainly Scorbutick: which notwithstanding appeared to be otherwise, because *antiscorbutic* Remedies, (of which indeed many, and almost of every kind were tried) were little or nothing beneficial. It was most of all to be admired, how soon after the beginning of this Disease, the flesh of the sick consumed, and they reduced to the leanness of a *Skeleton*, when in the mean time there was no great heat that might by degrees consume the solid parts, nor any violent evacuation, which might greatly take them down.

Besides these evils molesting the region of the head, a distemper no less dangerous oftentimes fell upon the breast. For in some, tho not in all, a Cough very troublesome, with abundance of spittle, and thick, was excited: this hapned in some about the declination of the Disease, to wit, whilst the confines of the brain were serene, as it were the clouds sent from thence to the Thorax, a great *Catarrh* suddenly rained down upon the Lungs. But in others, who especially had little infection of the Disease in the head, presently after the beginning of the Fever, a cruel Cough, and a stinking spitting, with a consumptive disposition, grew upon them, and suddenly, and unthought of, precipitated the sick into a *Pthisis*: from which, nevertheless, they recovered, by the timely use of Remedies, often beyond hope. It was observ'd in some, That after a long eclipse of the sensitive facultie, and oppression of the brain, from the morbid matter, at length tumors did follow, in the glandula's, near the hinder part of the neck, out of which, being hardly ripened and broke, a thin and stinking ichor or matter ran for a long time, and brought help. I have also seen watery pustles excited in other parts of the body, which pass'd into hollow ulcers, and hardly curable: sometimes little spots, and *periechiales*, appeared here and there: yet I never heard that any more broad or blew, of these kind, were seen in the sick. Notwithstanding, tho this Fever was not remarkable for very many malignant spots, yet it was not free from Contagion. For that in the same Family, it invaded almost all the Children and Youths successively, yea not rarely those of more ripe years, and at mens estate, who looking to the sick, were familiarly conversant in their Chambers, or about their beds, were infected with the same infection: But indeed, there was not so much cause of suspicion, that for it the friends of the sick should be wholly interdicted from commerce with, or visiting of them.

Altho the course of this Disease (unless when it intimately settled in the brain) did appear so gentle, and continued without any horrid symptom; yet its cure being always difficult, succeeded not under a long time: For the sick rarely grew well within three or four weeks, yea for the most part scarce in so many months. If this Disease fell upon men of a broken Age, or strength, especially those who were before obnoxious to *cephalic* distempers, as the *Lethargie*, *Appoplexie*, or *Convulsion*, it oftentimes kill'd them in a short space: but if there was any hope of recovering, it could be but slowly procured, (all Remedies whatsoever scarce bringing any sensible help) so that the sick did no sooner come out of the sphere of this Disease, than they fell into the confines of a Consumption.

If the formal reason, and courses of this aforesaid sickness be demanded, it here easily appears, the watering liquor of the brain and nervous stock, for the most part both together, with the blood, to be in fault; and the immediate cause, especially of the troublesome symptoms, to wit, forasmuch as this water, presently after the first assault of the Disease, was grown more poor than usual, and as it were lifeless; therefore a languishing, and enervation, with a *spontaneous* weariness and impotency to motion, hapned in the whole body, and with a sudden wasting of the body in the sick. Further, forasmuch as the same Liquor was stuffed with heterogeneous Particles, *viz.* partly narcotick, partly explosive; therefore a numbness, a sense of pricking, leapings up of the tendons and muscles, and contractures, also the *Virtego*, giddiness, and other more grievous *Cephalick* distempers did arise. Moreover, forasmuch as by reason of the evil of the nervous juice, being not quickly or hardly to be mended, the cure or healing of the Disease became so hard and lingring. But for that the fault of this *Latex*, necessarily depended on the diserasie or evil disposition of the blood, also of the depraved constitution of the brain, what their morbid dispositions were, and by what means they brought forth the beginning or tinder of the symptom of the Fever but now described, let us now see.

As to the former, it seems, that at this season, by reason of the hot and humi'd constitution of the year, and no blast from the north (the little bodies of which imbue the blood and juices of our body, as it were with a nitrous seasoning, and by agitating them, defend them against putrefaction) the blood in most men, and chiefly in Children,

The reason of them.

dren, Youths, and Women, became like standing-water, that so contracts a settling very impure, stuff with heterogeneous particles, and turning to a clamminess, and watriness; in which, the more pure spirit and sulphur, being somewhat depress'd, the watery particles, being carried forth with the impure salt and sulphur, were too much exalted. Wherefore the blood, both by reason of its *Crisis* or constitution being vitiated; also by reason of heterogeneous particles being heaped up more plentifully in its bosom, was made more fit, either of its own accord, or occasionally, or because of the contagion to receive a feverish Effervescency, so that from thence, very many fell at this time into fevers. But the blood growing hot, from the feverish taint being received, did not presently burn with an open flame, but like green wood laid on the fire, with a flame as it were suppressed, and much incumbered with smoke. Wherefore, the morbid matter, being heaped within its mass, was not wont (as in a regular fever) to be consumed by the burning, and its reliques at the set time to be exterminated by the *Crisis*: but yet, a little after the beginning of the fever, a great portion of this matter being poured into the head or *Thorax*, or into both at once, and afterwards being continually supplied in those parts, it induced either the aforesaid distempers of the brain and nervous stock, or cough with a consumptive disposition, or both together; and for this reason, about the beginning of this disease, when a pulse quicker than it ought to be, and a high coloured urine, and full of contents, did show the blood to grow hot with a Feverish distemper, the sick did not complain of heat, or thirst, because the blood growing hot, did lay up its impurities and recrements, forthwith into the provision of the nervous Liquor, or into the Lungs; wherefore, within these receptacles, the Symptoms presently became worse; but afterwards the disease growing on, a somewhat sharp heat, with scurfiness of the tongue, was wont to be troublesome to some: yea, in all, a slow, and as it were hectic fever, continued throughout; which neither by sweat, nor by insensible transpiration, could be so wholly removed, but that it was daily renewed, chiefly after eating, tho' never so small: which thing truly seemed to happen, because the nervous juice being full of the feculencies brought from the blood, did not afterwards receive them in so great plenty, but that these recrements, together with the nutritious humor, (and for that this was not consumed by nourishing the solid particles) remaining within the bloody mass, caused it then to grow feverishly hot.

2ly, Besides this morbid disposition of the blood, contracted from the intemperance of the year, it seems, that the brain also, from the same occasion, was made prone to the aforesaid passions. For when for a long tract of time, the southern winds did continually blow with a moist constitution of the air; from thence the passages and pores of the brain, being very much loosened and opened, and its connexion too much dissolved, they gave an easie passage to serous humors, and for all sorts of heterogeneous particles; wherefore the blood being very feculent and watery, as soon as it began to grow hot from the fever, carried its serous recrements and filths, presently thorow the two open doors into the head: for whosoever he was, who did not complain of his head, being too much stuffed with a moist air, and numbness of spirits; on the contrary, his pores being bound together by an intense cold, or drier air, all his senses and faculties remained more quick and lively.

These things being thus premised, concerning the morbid provision of the brain and humors, to wit, of the blood and nervous humor by reason of the constitution of the year, whereby indeed, very many at that time, fell into a slow, unequal, and long continuing fever, surrounded with *Cephalic* and *Convulsive* symptoms, and hardly curable: hence also it will be easie to unfold the reasons of the rest of the symptoms and accidents, chiefly to be noted in this disease.

Why this disease chiefly invaded children, women, and phlegmatick men.

For first of all, that this irregular Fever raged chiefly among Children, young Men, Women, and phlegmatick men, the reason was, because in those kind of bodies, the blood was apt to be more watery, and less perspicable, and from thence to gather a serous *Colluvies*, or watry humor and heterogeneous feculencies; and also, the brain being more humid and weak, easily received any recrements of the blood. Wherefore it may be observed, that those sort of persons, were found more prone to Convulsions, arising by reason of any other occasions.

The reason of the Atrophie coming upon the fever.

Secondly, the noted *Atrophie* or leanness, came so suddenly upon this fever, because by reason of the depravation of the nervous juice, the offices of nourishment, depending upon it (which as we have elsewhere shown, are highly active) presently failed. For altho we do not grant, the nervous humor to be only nutritious, but to dispense thorow the Arteries, a matter destinated to the nourishable parts, prepared in the bloody mass, yet it may be lawful to think, that the Liquor watering the brain and nervous stock, by means of an efficient cause, doth conduce very much to alimentation; for this grow-

ing turgid with animal spirit, actuates and invigorates the nutritious juice, brought to every part by the blood, and admitting it into the passages, and most intimate receptacles of the body to be nourished, and as it were leading it in, assimilates or resembles it; wherefore, when this household liquor is so depraved, that it doth not rightly supply the animal spirits, requisite about the work of nutrition, all the members and parts of the stomach vitiated in its tone, either spues back whatsoever nourishment is brought, or cannot receive it to its proper use: wherefore truly in this Disease, the bulk or habit of the body, however fuller or fatter, was more sooner pulled down, than in a continual Fever, where it might much more evaporate by the intense heat, or copious sweats. The reason of which is, because in a burning Fever, altho the blood growing very hot, exhales more plentifully; yet in the mean time, it continually affords something of nourishment, which the several parts helped by the benefit of the nervous juice, easily received and assimilated; but in this nervous Pestilence, altho the nutritive matter was sufficiently provided, yet by the defect of the nourishment of the spirits, the nourishment was altogether inhibited.

3. For the aforesaid reasons also, this Fever being a long while protracted, was wont scarce ever to be critically helped, and difficultly cured, by the help of almost any Medicines: For the feverish matter creeping presently from the beginning of the Disease into the nervous liquor, could hardly afterwards, and not but of a long time, be exterminated from its bosom: for that this water, with a slow motion, and flowing leisurely in the straight vessels, does not as the blood, conceive of its own accord a purifying effervescency or fermentation; neither can the forces of Medicines reach to it so easily and unmixed: but either they are first hindred by other parts, or because they are heterogeneous, they are wholly excluded from the brain, casting back whatever is incongruous. In truth for this reason, all distempers of the brain and nerves, as it were making a mock at Medicines, are most difficultly cured. Therefore in this Fever, if the evil impressed on the brain and nervous stock was taken away, either a cruel cough with plentiful spitting, or tumors, or an imposthume in the neck did follow: to wit, the morbid matter being supped back by the blood, and again deposited, settled either in the *Thorax*, or in the Glandula's and Emunctories, nigh the hinder part of the neck. But this Disease was the more contumacious, because the disease or evil constitution of the blood, was not easily mended: for altho from the beginning, its *Latex*, the recrements being poured forth, even into the nervous Liquor, grew but little and sluggishly hot; yet afterwards, these receptacles being filled, and the morbid feculencies, and besides the nutritious matter, not employed in nourishing the parts, being resident even in the blood, did aggravate it, and for the exclusion of this trouble, not to be immixed with it, did induce an effervescency, such as is wont to be in an hectic Fever, either almost continual, or presently apt to come again. For I have often observed in this Fever, from Grewel, Barley-broth, and other slender diet, no less ebullition of the blood to be stirred up, than from broth made of flesh: whether indeed the nourishing juice, supplying the blood from the chyle, because it was not employed in the work of nutrition, carried something heterogeneous, and not rightly miscible, as a trouble to the blood; and by reason of the particles of this superfluous juice, being copiously sent away with the *serum*, the Urine became very thick, red, and very full of contents: Also, for the same reason, the belly was for the most part loose, so far as the blood, filled full of the nutritious juice, did suck forth a lesser portion of the chyle from the bowels, and did pour back again part of that which had been brought to it on the intestines; the feverish Distemper did likewise stick so long in the blood, because, till the animal regiment being restored, nutrition was rightly performed, that superfluous matter was carried into the mass of blood.

Why this Fever was hardly curable.

We deliver the example, and the *Ætiology*, or rational account of this aforesaid Fever, more largely for this reason, because the same Disease did fall upon our Country-men, here and there also at other times: for that of late, in this City, all the younger people of a certain Family, were sick of it: yea, I remember, that some time past, very many laboured with such a Fever. Out of the many Histories and Examples of sick people, which it rendred when it was epidemical, I will here propose one or two.

A strong and lively young man, about the beginning of the spring, 1661, falling sick, without any evident cause, without any great heat or thirst, he became suddenly weak, and as if enervated, with a dejected appetite, and languor of spirits. *Cathartick Remedies, Antipyretics* or allaying of heat, digestives, and also antiscorbutics, and others of various kinds, administered by the prescriptions of the most famous Physicians, availed nothing: But, notwithstanding, the sick man hitherto languishing with a

Observation.

flow and wandering fever, with a quick and feeble pulse, a deep-coloured urine, had kept his bed a fortnight; besides being reduced to the greatest leanness, he complained of a giddiness, and as it were the fluctuation of a sound in his head, and a tingling noise in his ears. Altho he was troubled with a great stupor, yet his sleeps were mightily troubled with delirious fables. After four days, when the fever was not yet declined, it was thought good to take away four or five ounces of blood by Leeches, from the sedal veins; from hence the fever began to be much exasperated, for a great intense heat, with thirst, watchings, and almost continual tossing of the body, also the tongue dry, and scurfy, appeared; then quickly a troublesome cough, with abundance of discoloured spittle followed; to him were administered, *almond*, and *barly-drinks*, with temperate bechicks (or things to stop coughing) boiled in them: water of milk distilled with snails, and pectoral herbs, the shelly powders, prepared nitre, and often Cordial Opiats; which notwithstanding scarce giving any help, the sick man still became more weak; when in this manner being sick above two months space, the feverish distemperature, and cough also, daily growing worse, he seemed near death, at length a voluntary sweating arising, so that every night, or every other night, he sweat abundantly, and from thence finding himself better, using then the foresaid Remedies, he grew well within six weeks.

The reason
of it.

Till I had seen many sick people after the same manner, I suspected this disease to be altogether an hec tick fever with a consumptive disposition of the Lungs; but when I saw many others at that time fall sick ordinarily, after the like manner, I easily instituted the *Atiologie* or rational account of this feavour, such as I have already described: to wit, that the blood, because of the intemperature of the year, and perhaps from errors in diet, had contracted a vitious *procatarxis* or remote cause: Then it growing feverishly hot, and presently carrying its impurities to the brain, and so depraving the juice, watering it, and the nervous stock, induced the vertiginous distempers, with a *stupor*, a languishing of spirits, and an *atrophy* of the whole body: but so long as the blood did transfer its recrements, from its own bosom, into the brain and nervous *appendix*, the feverish heat continued more gentle and mild; but afterwards, when the tending downwards of the morbid matter, by the opening of the hemorrhoid veins, was drawn away from the brain, the same being first retained within the bloody mass, increased the fever; then being poured on the Lungs, excited the cruel cough, with plentiful spittle: but so far as the flesh of the Lungs remained free from putrefaction, as soon as the serous water was sent away by a more plentiful sweating, the sick man became free, both from the fever and *phthisis* or Consumption, that seemed so deplorable.

2. Observation.

In the mean time, whilst he lay sick, I visited another, about 12. years of age, after the like manner affected. But this when I was first sent for, having been sick above a month, was reduced to the leanness of a Skelliton: besides he was troubled with a *vertigo*, with a noise in his ears, and deafness, and also with a violent cough with yellow, and as it were consumptive spittle: his pulse was quick and feeble, his urine red and thick, his appetite much dejected, his spirits so languid, and his strength so cast down, that he could not keep out of his bed: I gave this Youth to drink often in a day, water distilled from milk, with snails and temperate herbs: besides I ordered him an open decoction, such as is in use for the Rickets, to be daily taken, instead of his ordinary drink; by the help of which Remedies, he was restored to his health in a months space. At this time I was sent for to many other people, of every age and sex, distempered by the same disease, now clearly Epidemical; for it running thorough whole families not only in this City and the neighbouring parts, but in the Countries at a great distance, as I heard from Physicians dwelling in other places, increased very much. Those for the most part labouring with this fever, so be they were otherwise whole, grew well by the fit use, and order of medicine and dyet: but it hapned very often but ill to those who were indued with a weakly constitution of brain and nervous stock, or broken with age; but not seldom the case of the sick became dangerous because the Physicians were not wont to be sent for presently after the beginning of the disease, yea, scarcely before it had more deeply spread abroad its roots, and the opportunity of healing was past.

3. Observation.

For that reason, this fever became very deadly, in the family of a certain Noble man among his children, originally obnoxious to Cephalic distempers. About the vernal Æquinox, a Boy of about eleven years of Age, began to be sick: At first without any vehement heat, or thirst, a dejection of appetite, and want of strength came upon him: Besides, an almost continual giddiness did trouble him, with a frequent danger of fainting, that he often thought he was just dying. By the advice of a certain woman at-

attending him, they daily gave him Clusters : then, when from the foulness of the Mouth and Tongue, manifest signs of a Fever appeared, this Emperick on the fifth day, gave him a vomit of the infusion of *Crocus metallorum*, and on the seventh day a Cordial Powder being administered, she incited the sick Youth covered with blankets to sweat : but presently he began to talk idly, complained that his Cap was fallen in, to the water, by and by becoming speechless, within four hours, whilst I was sent for, he expired before I came.

A little while after, the same disease fell upon his younger Sister : whose sickness however because it was accompanied with a frequent and humid Cough, was thought at first to be only a taking of Cold ; but within a few days, this Cough became plainly Convulsive : so that, whilst she coughed, the *Diaphragma* being carried upward, and with a renewed *Sistole*, held so a long time, she made a great noise as if about to be suffocated : then this little maid growing more apparently feverish, complained of thirst and heat, and lay all night without sleep with a mighty agitation of her body, and began to talk idly, after the same manner as her brother, of her coat being fallen into the water ; and when all things grew worse, she began to be tormented with Convulsive motions, first in her Limbs, by and by in her face, and then in her whole body : the *Paroxysms* coming by often turns, twice or thrice in an hour, did most grievously trouble her, so that this little wretch, within the space of 24. hours, after the Convulsive Distempers began to grow more grievous, her animal spirits being almost quite spent, she died ; whilst the Convulsive fits tormented her, her pulse was very much disordered, and often intermitting, also a frequent vomiting molested her. Being sent for to visit this maid, also too late, a little before her death ; when I could contribute nothing to the proroguing of Life, I endeavoured what I could, to find out from her death, the knowledge of the aforesaid disease, therefore having got leave to dissect her body, the reasons and marks of the Symptoms chiefly urging in this fever, more clearly appeared.

Opening therefore first the lower belly, I found all the bowels in it found enough and well furnished : The *Ventricle* altho tired with empty vomiting, contained nothing besides the Liquor, lately taken in at the mouth : for neither in it, nor in its *Appendix*, were worms, or sharp humors found which are wont oftentimes to give a cause to these kind of Convulsions : the small guts, were in many places involved : to wit, the *Convex superficies* of one part, was thrust into the concave of another, as into a sheath, and hid far in it, which indeed I judg to have hapned wholly from the convulsive motions of those bowels : for whilst by vehement Convulsion, excited from the nervous *origine*, the opposite *fibres* being drawn together, did work the same Intestine into contrary motions, it easily hapned that a part of the Intestine of the *Ileon*, being carried upward, might run into the hollowness of the other, being snatched downward.

The *Thorax* being opened, the flesh of the Lungs appeared very red, and as it were sprinkled with blood, yea in some places as it were livid, and almost black : out of the same wherever it was cut, there flow'd forth a thin and frothy matter. Certainly this shew'd, that the feverish matter, or the serous impurities of the boiling blood, being soon impacted in the Lungs, did so stuff up their pores and passagss, that the blood it self, being in its wonted and free Circulation, there stagnating, and being extravasated, did excite a certain Inflammation.

We found a no less clear tract of this so deadly disease in the head : for the shell of the skull being removed, presently the vessels, creeping through the *meningæ*, were seen to swell very much with blood, as if almost the whole mass of blood were gathered together in the head : for the veins being cut or broken, about the inwards of the lower and middle belly, little blood flowed forth : Besides, those membranes where they cloath the *Cerebel*, and being higher spread, divide it from the brain, being sprinkled in very many places with extravasated blood, were noted to be of a black purple colour ; that it was not to be doubted, but the *Phlegosis* or Inflammation round about excited, was the cause of the so cruelly infesting Convulsions. These coverings being taken away, the substance of the brain was seen to be altogether moist and watered above measure with a watery humor : yea, its rine or bark being taken off, all the *ventricles* were full of a limpid or clear water, of which kind of very clear Liquor, there was judged to be more than half a pint.

From these appearances, the *Pathologie* of the aforesaid fever is easily collected : to wit, in this sickness, as also in many others, the blood feverishly growing hot, presently deposes its recrements, both into the Lungs, and into the brain ; wherefore a serous Colluvies, or watry heap, did presently overflow the constitution of either ; then, because the blood being hindered, both here and there, from its due circulation, it

The knowledge of the disease found out by dissecting the Carcase.

The Pathologie of the aforesaid Fever.

began to grow into a very great heap, about the confines of the affected parts, and at length to stagnate, and to cause as it were a *Pblegosis* or Inflammation: hence by reason of the *Serum* being plentifully heaped up in the Lungs, and baked by the heat, the troublesome cough, with the thick and discoloured spittle, for the most part came in this disease; and by reason of the like affection, excited within the head, the *vertigo*, swimming, stupifaction, and other *Cephalic* passions, constantly seized on the sick: which kind of Distempers in this little Maid, and in her Brother, by reason of the infirm constitution of the brain, before in either of them, being made more grievous, terminated in an *Apoplexy*. I might easily here propose many other Histories of persons sick of this fever at that time, but from these but now recited, the Type of the aforesaid Disease may be sufficiently known: But because the same fever happens almost every year, on some predisposed; and perhaps by reason of an evil constitution of the year, may hereafter at sometime become *Epidemical*, it will be worth the while to represent some Method about its Cure.

The Curatory
Method.

Concerning which, first of all take notice, that in this fever no Critical days were to be observed, as in the vulgar continual fevers: for the blood as soon as it began to grow hot, poured out a part of the morbid matter, as yet crude, and not overcome, from its embrace to the head, or breast: wherefore it were vain to expect that the blood should suffer the heterogeneous particles to be heaped together, in its mass to a fulness, that from thence a flowing or putting forth arising, at the set intervals of times, it might thrust the same subtilties out of doors: yea rather this growing hot glows not with a great and open burning: but like a fire covered with chips, sends forth a moist smoke or breath, rather than a flame: But so that from thence by reason of the nervous juice being depraved soon in its disposition, and not rarely, because of the lungs being stuffed with the consumptive matter, the convulsive or phthisical or consumptive symptoms, did molest chiefly in the whole course of the disease.

Blood to be
taken away at
the beginning
of the disease.

It behoves us to design the curative Intentions according to the various times of the disease, and the diversities of the symptoms chiefly urging. About the beginning of this fever the taking away of blood seemed convenient almost to all. This kind of Remedy I often experienced with success in little Children: for that by the means as it were another breathing place is opened to the mass of blood, silently and covertly growing hot, and obtruding its foot or smother on the more noble parts; and for that reason its impure effluences or puttings forth are drawn away from the brain and lungs. Therefore altho this fever of an ill Condition may be accounted as it were malignant, yet so far as the blood is not presently apt to be coagulated, but to be too much poured forth, and to bestow its serosities on the nobler parts, to wit, the brain and lungs; therefore *Pblebotomy*, so it be administered in the beginning of the disease, is convenient almost to all.

For the same reason, *Cathartick* Medicines, and chiefly vomitory, are administered at the very beginning of the disease; for these do not only evacuate the *viscera* of concoction, and so draw away the chief fomenting of the disease, and as it were its original, but besides, they draw forth the serosities from the blood, and so effect its cleansing rather in the stomach and intestines, than in the head and lungs. Further by Emetics, for that the receiving *Glandulae* of the *Lympheducts*, are pulled with a great shaking, the superfluities of the nervous juice, lest they should evilly affect the brain, and its dependencies, are expressed forth into the lower bowels: also for this end the belly is to be kept continually loose by the use of Clysters. But in the mean time, whilst the blood being infected with the taint of this disease threatens the brain or *præcordia*, with the evil, it will not be safe to attempt any thing with *Diaphoreticks*, or sweating medicines, or *Diureticks*, or such as evacuate by urine, or also with *Catharticks*, vomiting and purging medicines: For these kind of medicines, so far as they greatly pour out the blood, and compel its serosities into more open issuings forth, all the recrements being apt to fall away from the mass of the blood are easily obtruded on the brain, or lungs, when they are of a more feeble constitution: So in the youth above-mentioned, a loss of speech, came upon the raising of an untimely sweat: Also I have known that *Sudorificks*, no other than chaley beats in the morbid disposition of the lungs, have brought on a wasting or Consumption.

Vomits and
Purges are to
be admini-
stered.

Blistering
plaisters.

Pblebotomy therefore, and if need be, vomiting or purging either one or other, or both, being to be made use of at the beginning of the disease, the other intentions shall be to draw away the morbid serosities of the blood, apt to flow forth on the head or breast, and to derive them gently by other ways of evacuation, and to put them forth of doors. To this end *Vesicatories* or blistering plaisters ought to be applied to the nape of the neck, or *Parotida* or *jugular Arteries*, or to the Arm-pits, or the Groin, or about the Thighs or Calves of the legs; sometimes in this part, sometimes in that;

to wit, that the little Ulcers being here and there excited, and continually running, might plentifully pour forth the *serum*, imbued with the morbid and heterogeneous particles.

But Remedies gently carrying the *serum* into the Reins and urinary passages, are most often administred with success: For this business, *diuretical Apozems* and *Julups* are to be ordained after the following forms.

Take of the Roots of *Scorzonera*, *Cherfoil*, *Grass*, and of *Eryngoes* candied, each six Drams, one *Apple* cut, of the leaves of *pimpinell*, *meadow-sweet*, each one handful; of *Raisins of the Sun*, an Ounce and a half, of *Harts-horn* burnt two Drams; being cut and bruised, let them be boiled on a clear fire, in four pints of spring water to the consumption of the third part; to the straining being cleared two pints, add of the *Syrrop* of green *Cytorns*, or *Violets*, two Ounces, of *Sal prunella* one Dram and a half, make an *Apozem*. The Dose four to six Ounces, thrice in a day. *A diuretick Apozem.*

Or into that straining, put 15 blanch'd sweet *Almonds*, and of the four cold seeds, each one Dram; being bruised, make an Emulsion according to Art. *An Emulsion.*

Take water of *Dragons*, and of *black-Cherries*, each four Ounces, of *scordium com.* pound two Drams, of *Tbreacle* water an Ounce and a half, of *Syrrop* of *Clove-gilliflowers* two Ounces, of the *spirit of Vitriol* twelve drops, make a *Julup*. *Julup.*

Take oftentimes in a day, in small Beer or Posset-drink, half a Dram, or two Scruples of *Sal prunella*. *A Powder.*

Besides in this Fever, medicines gently sweating, of that sort chiefly which restores the animal spirits, and defends them from any heterogeneous *Copula*, are of very great use: wherefore, either the powder of *Pearls*, or the spirit of *Harts-horn*, or of *Blood*, in a moderate Dose, are administred twice in a day, viz. Morning and Evening. *Gentle Diaphoreticks.*

Clisters are to be given almost every day; and if it be thought fit, a gently loosning purge may be taken once or twice in a week. *Clisters.*

The diet prescribed ought to be slender, as in other Fevers, let them be wholly interdicted from flesh, or broth made thereof, only let the sick feed on Grewel, or Barley-broth, and let their drink be small Beer or Posset-drink. *Diet.*

If that, notwithstanding, any preventive Physick, the Morbific matter should lodge in the Brain, or Lungs, or both together, so that a dissolution, or inordination of the animal function, or also a violent Cough should assault them; it must be consider'd, what is to be done in either state of the Disease, carried forth after this manner into an evil condition; but then the curative Indications ought to respect the stupor, or madness, or cough: and lastly, if in the declination of the Disease, these symptoms do remit, proper Remedies are to be adhibited against the *Atrophie*, as it were the last fortress of this Fever.

First, Therefore if the morbid matter, as it is often wont, being brought to the brain, should bring in an insensibleness, or a soporiferous or sleepy distemper, remedies drawing it another way, and deriving it some way from the head; and besides, such as stir up the animal spirits, and take away the impure *Copula*, ought carefully to be administred; wherefore in this case, the use of *Epispasticks* or such things that draw the water outwardly, should be much increased, and let the spirit of *Harts-horn* be exhibited almost every sixth hour, in a little bigger Dose; let blood be also taken by the sucking of Leeches, more largely from the jugular veins, the *Salvatella*, or the sedal veins. If the Distemper remits not, the head being shaven, let *Emollient fomentations* be often applied thereto: Further, let *Cupping-Glasses*, *Plaisters* and *Cataplasms* be laid to the soles of the feet, and other means of administrations, such as are commonly prescribed for the curing of the stupor, or insensibleness, ought to be used: in like manner, if on the evil, or no Crisis of this Fever, a Phrensie, or madness should come, Remedies appropriate to those Distempers are made use of. *The Curatory method in the insensibleness and madness.*

Secondly, But if either with, or without this sort of displeasure brought to the head, the Lungs also have taken the evil of this Disease, so that the sick, not yet free from the Fever, seem to fall into a wasting, or Consumption, with a troublesome Cough, with abundance of thick, and often discoloured spittle; Medicines commonly prescribed for such kind of Distempers are convenient enough; wherefore pectoral Decoctions, Electuaries, Syrrups, distill'd waters of Milk and Snails, and other Remedies of the like nature, ought diligently to be made use of; the forms of which may be found in the before-described Cases. *In the Cough.*

Thus far we have described the continual Fever, for the most part Convulsive, and arising no less from the fault of the nervous juice, than of the blood: I will here further propose an example of a Disease, having the likeness of an intermitting Fever, but radicated chiefly in the nervous juice; the nature of which kind of Distemper, for that it is very rare, and truly pertinent to our convulsive *Pathologie*, will appear from the following History.

A very rare
Observation.

A noted Woman very young, and indued with a more weak constitution of brain and nervous stock, and for that cause very obnoxious to Convulsive Distempers, after she had conceived with Child, about the fourth month of her being big, from cold being taken, she was grievously afflicted with Astmatical fits; and besides, with a frequent sinking down of her spirits: but by the use of Remedies, indued with a volatile Salt, she grew well within a fortnights space; but after that, about fourteen days, an unwonted and truly admirable Distemper fell upon this Gentlewoman.

One morning, awaking after an unquiet sleep that night, she felt a light shivering in all her body, as if she had had the fit of an Ague: frequent yaunings and reachings, with an endeavour to vomit followed thereupon: then her Urine, which was but now of a citron colour, and of a laudable substance, became pale and waterish, and was rendred at every turn, to wit, almost every minute of an hour: moreover, about her loins, and *hypochondria*, and in other places, pains with light Convulsions running about here and there, were excited: which kind of symptoms plainly Convulsive, with her frequent making of a lymphid Urine, continued in the Morning almost to the Evening, in which space of time, a great quantity of water, at least three times more than the liquor she had taken, was rendred; in the mean time, neither was the heat great, nor did thirst trouble her, nor was her pulse encreased: In the evening the aforesaid Distempers ceased, and her Urine became citron colour and moderate; and besides, all night she enjoy'd a moderate sleep; then the morning following, about the same hour, the fit returned, accompanied altogether with the like symptoms, and so daily acted the same Tragedy.

The reason
of it.

Visiting this Gentlewoman, after she had been sick in this manner for twelve days, I framed the *Ætiologie* of the aforesaid case, to wit, That this Disease, chiefly radical in the nervous stock, did depend upon the effervescency and flux of the humour, watering the nervous parts: For it might be suspected, that this water being diffused from the blood, made degenerate by reason of the suppression of her Terms, upon the brain and nervous stock, became more sharp and serous than it ought to be, and for that cause incongruous to the containing parts: wherefore, being gathered together to a plenitude, by the nights sleep, it did stir them up or provoke them, for the expulsion of it, every where into wrinklins and contractions: hence shiverings, yaunings, stretchings, and wandring pains were excited in the whole body: Furthermore, from the solid parts, after this manner contracted and shaken, not only the nervous liquor, but also the nutritious every where laid up in the solid parts, but not truly assimilated, were shaken off: and then, either *Latex*, being exterminated from its receptacles, and received by the Veins, or Lymphaducts, or water carrying Vessels, was render'd to the mass of blood: from whose bosome, before it had acquired a lixivial tincture from it, being at last cast forth by the reins, constituted a clear and copious Urine: But that this Distemper observed such exact periods, the reason is, because the nervous water being supplied with an equal dimension, did arise to a fulness of running over, daily at the set time: Therefore also, the Urine appeared concocted and yellow, before and after the fit, because then its matter consisted only from the *serum* of the blood: Afterwards, during the Convulsive fit, the lymphid humour being shaken off from the solid and nervous parts, and passing quickly thorow the blood, adulterated the colour and the quantity of the Urine. I prescribed to this big-bellied Woman, Phlebotomie, and besides, a Powder composed out of *Coral*, *Pearls*, *Ivory*, and other *Cardiacks*, to be taken thrice in a day in a proper liquor; morning and evening she took of the *tincture of Antimony* twelve drops (whose singular effect in the too great flux of Urine, I have many times experienced:) By the use of these, all the symptoms ceased in a short time.

CHAPTER IX.

Of Universal Convulsions, which are wont to be excited, because of the Scorbatic disposition of the Nervous juice.

Thus much concerning universal Convulsions, diffused thorow the whole nervous kind, which come upon Fevers; and especially concerning the Convulsions which are wont to be excited in the commonly called *malignant hectick Fever*. There yet remains (which was proposed in the third place) for us to shew, by what means, and from what causes, universal Convulsions are induced, without Poyson or Feverish infection, by reason of the scorbutick, or otherwise vitious dyscrasie or evil disposition of the nervous juice. For indeed, the liquor watering both the nerves and the nervous parts, sometimes descending from its natural disposition, is so much stuffed with heterogeneous and explosive Particles, that the animal spirits admitting an incongruous *Copula*, every where growing to themselves, are irritated into continual, as it were, cracklings, or convulsive explosions: These kind of affections of the spirits are either divided or separated, between which no communication or dependency intercedes, *viz.* When many parts of the body are troubled at once with so many Convulsions proper to themselves, which do not come successively one from another, but are terminated in the same muscle or member where they begin: After which manner, I have known some sick people, who have had their Muscles and Tendons all at once in their whole body, perpetually to leap forth with so many distinct Convulsions. Or, Secondly, the Convulsive Distempers, which are excited in the whole nervous kind together, are continued or connex, which succeed one another with a certain perpetual vicissitude continued between themselves: Forasmuch as inordinate motions, almost of all the members, mutually relieving themselves, being risen in one part, presently pass over to others. For so *Horstius* relates of a Maid obnoxious to Convulsive motions, whose Members and Limbs not only were forced into divers manner of flexions and distortions; but besides, as if agitated by an evil spirit, not being able to stand in a place, she was necessitated to run up and down here and there, and to dance and leap in the Hot-house; nor could be hindred from it by any force or chiding, but that she would run here and there; now she would cast her self on her feet, now impetuously fling her self after another manner; for if she did endeavour never so little to be quiet, presently her *Præcordia* was most grievously afflicted. Wherefore, the business of our present task is, to enquire a little more exactly into the nature and causes of either Convulsive affection, to wit, both of that which is affected through the very much leaping of the Tendons and Muscles together; and of this, which is caused through the madness and inquietudes of the members of the whole body: that from thence it may appear, what method of healing ought to be administred in either case.

Universal Convulsions by reason of the Scorbatic disposition of the nervous juice.

Two kinds of these, viz. Separate, and connex or joyned together.

As to the former kind, it easily appears, that these kind of Distempers are not simple, but complicated, to wit, of a Convulsion and Palsie. For the Muscles and Tendons are perpetually urged with Convulsive motions, notwithstanding, the sick being made weak, they are not able strongly to move any of their members, or their whole body: yea, to these Distempers, pains equally diffused thorow all their Limbs are adjoyned. Hence we may infer, that the animal spirits are imbued with a manifold *Copula*, *viz.* both with explosive, and also narcotick or stupifying, and in some sort irritative or provoking Particles: so that, although being alway burthened, they enter into explosions, yet, not many together, nor indeed any hastily or strongly are exploded, by reason of the other interjected Particles of another kind; wherefore the motive force does not long continue, but is short, and as it were interrupted: just as if Gun-powder being kneaded with some muddy substance, should be fired: for then the whole mass is not let off at once, with a noise, nor does one heap presently fire another, but a few grains only, and those successively, to wit, one a little while after another, with small crackling noises, are let off or exploded: In like manner the nervous liquor is stuffed thorowout with Convulsive particles, which even cleave to the spirits: but forasmuch, as some narcotick, and other painful ones are mingled with them, the elastick force of the former, however lasting, and greatly diffused, is yet much broken, and every where cut off.

The nature of the broken Convulsive distemper.

An Obser-
vation.

For the illustrating this kind of broken convulsive Distemper, I will here describe a very notable case of a certain Gentleman lately living in this neighbourhood: which being truly admirable, not any writings or observations of Physicians have scarce shewed the like. An honourable Gentleman, whom I knew, sprung from Parents and Grand fathers obnoxious to a someways morbid disposition, either of the brain or nerves, about the hight or beyond the strength of his Age, the fruit of this diseased race began to punish him: for first of all, he was wont to be tormented with a debility and numbness of his Limbs, and with light Convulsions; with which kind of Distempers, when he had a while laboured, at length for cure sake going to the Bath, having used too much the hot Baths, instead of a remedy, he brought back only an exasperation of the Disease, that from that time the aforesaid symptoms did not any more torment him by fits, but almost continually, to wit, the Convulsive motions, and painful extensions, did incessantly exercise every Limb, yea, every part of his Body, so that all the muscles were perpetually drawn together, with repeated leapings all at once, and that not without great torment: The only means he had for quieting them, was to exercise his whole body, sometimes some of his members, perpetually with a local motion: for so long as he was awake, he was necessitated to be rock'd in his Bed, or on his Couch, or to be carried in a Coach, or to have his members press'd or rubb'd; for which end they had made for him a Bed, and a Chair set upon bow-fashion'd feet, such as are on Childrens Cradles, in which, when he lay down or sat upright, he was moved up and down continually, with a tottering or rocking motion; which unless he did, he was infested with most cruel pain, and horrid extensions of his muscles: This kind of daily trouble of the Convulsive Distemper, in the night-time, and presently after sleep, entertain'd much more grievous symptoms: for being newly awaked, his whole body presently was wont to quake, his muscles to be exercised with painful stretchings, every Limb to be wetted with a squalid or ill-savour'd sweat, as if in the agony of death, which was so very Corrosive, that, like *aqua fortis*, unless they presently wiped it off, it quickly eat and rotted the Linen. The sick man, during this conflict, was tormented for many hours, between the sweats and shiverings, until being quite tired out, sleep creeping upon him, brought him some ease; but if at the approach of the fit, he was presently taken out of his Bed, he was better, and so prevented the wonted cruelty of the Distemper: Therefore, as soon as he was awaked from sleep, though it hapned within half an hour, immediately to avoid the torture, his servants being called, they took him out of his Bed: As to his Appetite he was well enough, he eat without loathing, nor was his stomach disturb'd with what he eat: But he did often complain of the pain of the heart, and sometimes a troublesome spitting, with a stink in his mouth, as if he had taken *Mercury*, molested him for many days. All hot things, whether Food or Physick, did not agree with his constitution; he did not dare to taste, either Wine, or strong Beer. In the first years of his sickness he abhor'd the very sight of the fire, afterwards becoming weaker, though the winter was sharp he would not sit near the Chimney; his Urine was always of a citron colour, which if it were evaporated in an earthen vessel, over hot coals, saltish sculencies remained in the bottom, to above half the liquor; his belly was continually bound, and never put forth its load, unless provoked by a Purge or Clister: Yea, besides the Convulsive motions, a spurious Palsie possessed every member of his whole Body; for he could not lift up his hand, nor step a foot forward; his tongue shaking, brought forth his words but imperfect; but sometimes, when his mind was carried forth by some sudden occasion of joy, he would be able, his spirits being raised with a wonderful strength, suddenly to rise out of his Chair, and without the help of another, to stand upright, and to jump, which interval however lasted scarce a minute of an hour, but that his members flagg'd, and were affected with their wonted languor and trembling. When this worthy Gentleman had been sick after this manner above twelve years, and had consulted the most famous Physicians in all *England*, and had tried very many Remedies, and almost of every kind, *viz.* Antiparalytick, Antiscorbutick, drying Diets, sweating Medicines, Purges, Causticks, Baths, Liniments, yea, and had twice tried Salivation, could find no cure by any method of healing; wherefore, all hope of cure being wholly laid aside, for the latter seven years of his life, he made use of only Remedies, chiefly respecting some symptoms, *viz.* he took thrice in a week a solutive Medicine of *Senna* and *Rubarb* with correctives, now in form of a Syropp, or of an extract another time; every night he was wont to take a Dose of an opiate, out of conserves, and temperate Species: Besides, as occasions served, he had ready a Julup, to be taken when his spirits fainted: moreover, he continually drank Beer made of Oaten Mault, altered with temperate and diuretical herbs. By the use of these he pass'd over at least seven years, without any great alteration for the worse; at length, old age coming on him,

together

together with the Disease, more cruel fits of Convulsions, not as at first after sleep, but as soon as he was warm in his bed, invaded him, that he was forced to abstain altogether from his Bed, and rarely put off his clothes, unless to shift his Linen: from hence transpiration being hindred, the serous recrements, and others wont to be evaporated, were fixed on the Lungs, which at first brought in a frequent or short breathing, afterwards an Asthmatical Distemper; and lastly, a deadly consumption or wasting.

If the reasons of the aforesaid symptoms be sought after, it will be easie to deduce all these evils from a depraved constitution of the Brain and Nervous stock, and more immediately from the discriasie, and fault of the juice watering those parts. For when that Liquor, in which the animal spirits do abound, was, as to its temper, highly sharp and corrosive, like *Stygian* water; and as to its mixion, was stuffed full of both narcotick and explosive Particles, it is no wonder, because the spirits being very much burthened, and for that cause restrained from their due expansion, that they should be forced every where into small explosions, as it were cracklings; and that the containing bodies, being loosed from their due extension and strength, should be also continually irritated into painful corrugations or shrinkings up.

The reasons of the symptoms chiefly tormenting.

Those Convulsive Distempers did more sharply infest after sleep, because the heat of the Bed, did exuscitate or stir up the heterogeneous Particles of the nervous juice, and rarifying them, as it were, compell'd them into explosions; then also, because the nervous parts did imbibe its juice in sleep, and a more plentiful provision of the moribific matter, brought together with it; which being filled to a plenitude, at the first instant of waking, they immediately endeavour to shake off what is troublesome. For this reason it is observed, that the pains of Scorbutical people, and the fits of Asthmatical, are made worse by the heat of the Bed, and by sleep; therefore as in these, presently to leave the bed, was wont to give ease, so likewise it did in our sick man: But that the trouble, excited by the continual leapings, and painful extensions of the muscles, was somewhat allayed by the local motion, or moving from one place to another of the body, or members; the reason is, because the animal spirits, whilst they are compelled to divers actions from without, they remit whatsoever inordinations are excited from within: for as in pain, and itching, which are lighter Convulsions, it helps, to press, rub, or scratch the affected part; so the Convulsive motions of the muscles and tendons, are somewhat pleased, by the inordinate agitation of the whole body, or the members.

The growing worse presently after sleep, whence it proceeded.

Why allayed by motion.

As to the *Ptyalismus*, or copious spitting, with the stinking breath, which was wont to return at uncertain intervals, we do suppose that might perchance proceed from *Mercury* sometime secretly given, although I have seen many labouring both with Convulsive, and also Scorbutick Distempers, in whom this kind of perpetual defluxion of spittle from the mouth was very troublesome, without any suspicion of *Mercury*; also some (as shall be told hereafter) on whom a salivation coming (the explosive matter being after this manner critically evacuated) help'd the Disease: moreover, it is likely that this Distemper was produced from the meer recrements of the nervous juice; and that the salival passages, when many, and enough were open, did receive, and convey forth of doors, the superfluities plentifully deposited in the *Glandula's*, from the Nerves, and also from the Arteries.

The Spitting.

As to the lucid intervals, whereby the sick man us'd to obtain some truces, though short, the cruelties as it were of the Disease being mitigated, as when but now his sickness had bound him to his chair, he was able on a sudden to leap up, and walk about; but yet, this unlook'd-for strength being vanish'd, by and by falling again into his wonted languishment: I say, these kind of motions of labouring Nature, prostrate under a great burthen, are its utmost endeavours, and some more strong inforcements, to wit, whereby for a moment of time she recollects her self, and attempts as it were to shake off the yolk of the Disease; but because she is not able to sustain long this strife, she quickly relapses, and lies down under her former burthen. Truly it is a wonder, how much above the strength of Nature, Anger, and Fear, and some other Passions of the mind, do stretch the nervous kind, and compel them to shew a force plainly stupendous: But these prodigies of her attempts, are only of a small duration.

Why this sick man obtained some truce from pains.

The conjunct cause of the aforesaid Disease being after this manner designed, and the reasons of the symptoms chiefly tormenting, being shown, it remains yet for us to inquire into the leading cause; to wit, by what occasions the nervous juice being become so degenerate, at first brings in the Palsie, and then leapings, or intestine Convulsions of all the muscles: further, we ought to explain wherefore the fruits of this Disease, increasing by little and little, came suddenly to maturity, by the use of the Baths; also wherefore this sickness yielding to no Remedies, became incurable.

The secret leading cause of the aforesaid distemper.

As to the first, it may be said, that the sick Person, being sprung from Parents who were obnoxious greatly to Cephalic Diseases, had contracted originally an evil Constitution of the brain and nervous stock, so that within the 6th lustre (i. e. about the 36th year) of his Age, he began to be sick of a spurious Palsie, then, when the evident causes daily fixing the infection more on the blood and humors, did happen upon this remote hereditary cause (for there were many chances and unfortunate accidents, which continually brought sadness, and melancholly upon this Gentleman) indeed therefore, the nervous Liquor being imbued above measure, with a fixed and Scorbatic salt, became highly sharp and irritative, like *aqua fortis*, or the Stagma's of *Vitriol*; and so continually incited the Spirits, and the bodies containing them into corrugations and contractions, just as the aforesaid Liquors when poured upon worms do the same thing.

Why this Distemper grew worse by the use of the Baths.

But that this disease, leasurely at first increasing, was quickly brought into a much worse condition, by the use of the hot baths, the reason easily appears: It is known by experience, that the hot Baths do very much exalt and quickly bring to the height, the Sulphureous-saline particles in the humane body, and otherwise morbid, which abound in the bowels and humors, viz. do render them more fierce by agitating them thoroughly, and force them from their first passages into the blood, and from thence into the brain and nervous stock, yea, and joyn together those that were before separate, and idle, and incite them into a certain fermentation: wherefore, those who are hereditarily obnoxious to the Gout or Stone, and have not as yet suffered any fits of those distempers, very often feel the fruit of either disease in themselves to grow ripe soon by the use of the Baths: when therefore in this sick person, both the blood and Liquor, watering the Brain and Nerves, were imbued both with narcotick or stupifying, and convulsive particles; and also when they did degenerate from their sweet and Balsamy Disposition that towards a saltish, and this into a sour, Ciemul of a Stagma of *Vitriol*, the use of the hot mineral waters was so far from bringing help, that on the contrary, these evils, for that very cause, presently grew all very much worse: and the Disease, proceeding from the humors being so depraved, as to their temper and mixture, could never be cured by any medicines, no easier than vinegar may be reduced into wine.

When this Gentlemans body, being at last dead of the *Phthisis* or *Consumption*, was opened by me, we could find but very few foot-steps of these kind of most grievous Symptoms. Hence, as it appeared, the Palsie and Convulsion, did not depend so much on a thick and copious matter, heaped together somewhere in mines, as of an evil affection of the animal Spirits, who are subtle and invisible. I will lay forth, what was worthy taking notice of in the Anatomy of this Person.

Things worthy to be noted in the body being dissected.

The *Abdomen* being opened, the *Caule* (as is wont to be in most who die of a Consumption, and other Chronical Diseases) was putrified and almost consumed. In the mean time, the *Ventricle*, *Intestines*, *Pancreas*, and *Mesentery*, were well enough, to wit, the membranes were firm, well-coloured, and free from any ulcer, or hard swelling: There grew to the greater intestines certain excrescencies, like to the ears of a mouse; for that there were very many of these kind of things out of either side of the *Colon*, and right intestine, they shewed like twins at certain distances, like the branches of trees: The like I formerly found in a consumptive Person: The Reason of this seems to be, that the nourishment in Consumptive people, (tho it be deficient about the more solid, and outward parts, yet sometimes) within near the fountains of the nourishing juice, performs more than it ought, and for that cause, superfluous and unnatural additions grow forth.

The milt or spleen, which always is thought ill of, and of most Physicians condemned, for being the principal cause of the Scurvy, and of all other distempers, appear altogether blameless, and free from any fault: For, as in most sound people, we observed, it was of a darkish Colour, soft, and of an equal superficies, free from any obstruction, or swelling, indued with vessels, and fibres, distinct, and firm enough: out of its substance, flowed black blood when it was cut.

The Liver, (which indeed might be wondred at) was indifferently well, neither was it, from so long and grievous a sickness, become harder than usual, or scirrhus, or platted with little whelks, but it was somewhat big, and of a darkish colour.

The Kidneys, tho free from any ulcer, or gravel, were not however free from fault: for in the middle of the right Kidney, was seen a great cavity, distinct from the Tunnel, and much greater than it, full of clear water; the like I have very often found in hydropical people: But indeed, this perhaps arose from the serum deposited in that kidney, that could not easily be strained thorow its passages and pores; for that the serum subsisting therein, had in the beginning made for it self a little den, which afterwards by

by degrees was enlarged; and when for this reason, the secretion of the *serum*, and its passing forth by the *ureter* were something hindered, its *Latex* reſtagnating into the blood, brought in the grievous trouble to the head; which indeed, was the rather to be ſuſpected, becauſe alſo the left Kidney being mightily extenuated and conſumed, contained many ciſterns and cavities full of clear water.

The Lungs growing on every ſide to the *Sternum*, (or part of the breaſt where the ribs meet) ſides, and *Diaphragma*, ſeem'd without any diſtinction of *Lobes*, of one ſubſtance only of putrid ſpongy fleſh, ſtuffed throughout with a frothy or ichorous matter: without doubt, the ſick man had not contracted this evil ſo long before, to wit, when he was not able to perform any exerciſe of the body, nor ſtay in bed that it might breathe out any thing more freely; the ſeculencies and recrements of the blood, which were wont to evaporate thorow the ſkin, being laid up in the Lungs, were the cauſe that they grew together among themſelves, and with other parts, and did vitiate their tone and conformation wholly, ſo that a Conſumption being at laſt ariſen, was the effect and product, and not the cauſe of the reſt of the Diſtempers wherewith he had been a long while miſerably afflicted.

In either ventricle of the heart, blood was concreted into a ſolid whitish ſubſtance, and baked like fleſh; which being formed near the cavities and proceſſes of the veſſels of the heart, reſembled the figure of a Serpent, with a manifold divided tail: than which indeed nothing is more uſual, in many dead People after long ſickneſs: The reaſon of which is, that the blood being without life, from long ſickneſs, and from thence circulated ſlowly about the *Præcordia*, begins to ſtand or itagnate in the heart, and depending veſſels, and by that means is congealed leaſurely into this kind of fleſhy concrete.

When the Skull was opened, we ſought among its contents, the chief cauſe of the Diſeaſe: The firſt thing that occurr'd was, the bulk of the brain was leſs than it ſhould be, and folded into fewer folds, from whence we ſuſpected, that the animal ſpirits were not plentifully enough brought forth: Further, the whole ſubſtance of the head was more moiſt than it ought to be, and wholly immerſed in a wet watery humor; that its covering, *viz.* the whole meninges were pulled aſunder, and the compaſſing or crevices, and all the ventricles run over with clear water. 'Tis probable, that this deluge of the brain had lately hapned, to wit, forasmuch, as by reaſon perſpiration being hindered, and the ſecretion of Urine being but little, the ſerofities gathered together in the bloody maſs, were carried to the head; and therefore the ſubſtance of the brain, and eſpecially the cancelled or chequer'd bodies were ſo wholly wetted and ſoked, that being cut, their ſubſtance could ſcarce remain compacted, but that it would flow away, ſomewhat after the manner of thick liquids: within the boſoms overlying and infered to the brain and its *appendix*, and the veſſels coming from them, the blood had concreted into little, round, hard, and as it were fleſhy balls, juſt like thoſe within the ventricles of the heart, and the veſſels hanging to them, which alſo lately, when the blood circulated ſlowly, we thought might happen for the ſame reaſon, for which the blood was coagulated within the *Præcordia*.

The trunk of the ſpinal marrow being drowned in clear water, was very much extenuated, that it could ſcarce fill half of the bony cavity or hollowneſs: which we thought to be effected by the deluge of ſalt *Serum*, in which it was as it were boiled.

So much concerning univerſal Conſuſions, which being very much conjoyned with the Paralytick Diſtemper, are excited dividedly in many parts at once: There remains others which we call'd continued, becauſe being ſuddenly tranſlated from ſome parts to others, they mutually relieve one another, and compel the members, now theſe, now thoſe, and often the whole body, to be involuntarily moved, and diverſly bended or agitated. In theſe caſes the animal ſpirits, not only thoſe implanted in private corners, and mines, get to themſelves an exploſive *Copula*; and being ſome how ſatiſfied or irritated, ſtrike it off by certain turns; but when the whole maſs of the nervous Liquor, abundantly abounds with elatiſtick particles, they then every where cleaving to both the ſpirits implanted and flowing in, for that reaſon ſtir them up into continual Conſuſions: But forasmuch, as not all the ſpirits at once are not able, however pre-diſpoſed, to be exploded, (becauſe within the nervous paſſages there is not room large enough for their ſo great agitations) therefore the exploſive force ariſing in theſe, or thoſe parts, is by and by transfer'd from thence unto others, and ſo to others, and ſo like fire drakes, or wild-fire, it runs wandringly here and there, moſt ſwiftly creeping from theſe Limbs to thoſe, and then preſently from all into the *Præcordia* or *Viſcera*, and back again. That the Image of thoſe kind of Diſtempers may be known, we will here propoſe ſome more rare caſes, of ſick perſons, whom ſometime paſt I endeavour'd to cure.

The nature and the manner of the continued convulſive diſtemper being made.

1. Observation

A very fine and religious maid, tall and slender, begot of a Father sickly and obnoxious to most grievous Distempers of the nervous kind, about the 20th year of her Age, was afflicted for many days with an head-ach, very cruel and periodical; at length, at that time of the winter solstice, 1656. the pain of her head ceased, but instead of it, a mighty Catarrh followed, with a thin and copious spitting, also an ulcerous distemper of the nose and throat; when she had for some time endured this trouble, at length, by the prescript of a certain Woman, receiving the fume of *Amber* by a tunnel into her mouth, she was suddenly cured, to wit, the Catarrh, or violent Rhume ceased suddenly, but from thence she complained of a notable *Vertigo*, with a pain in the head, and of the tingling noise of the ears: on the Third Day, the tendons of the hinder part of her neck, were pulled together, that her head was bended now forward, now backward, and now of one side, sometime it continued stiff and unmovable; a little after this, the same kind of Convulsive Distemper invaded the outward members and Limbs of the whole body, her arms and hands were wonderfully turned about, that no juggler or tumbler could imitate their bendings, and rollings about; she was necessitated to spread abroad her leggs, and feet, here and there, to strike them against one another, and to transpose or cross them by turns: After this manner either sitting in a Chair, or lying in a Bed she was perpetually afflicted with these Convulsive motions, unless when overwhelmed with sleep; and when she did a little restrain her members from the great labour of the Muscles, presently she was taken with a difficult and short-breathing with a sense of Choaking; but in the mean time, her eyes, jaws, mouth, and lower bowels, remained free from any Convulsion; neither was she troubled with vomiting, belching, nor any inflation of the belly and *hypochondria*: Besides she was still her self, and had truly the use of her memory, understanding, and phantasie, she did, nor said any thing madly or foolishly: but in these wonderful evils she shewed an admirable example of Christian fortitude and patience, even with godly and discreet speeches; her appetite was soon lost, so that she took any meat or aliment very unwillingly; thirst continually troubled her, and her strength was grown so feeble, that she could not stand or walk, her urine was of a Citron colour, very full of saltness, on whose *superficies* grew little tararous skins.

When I was sent for to this Gentlewoman, on the Sixth Day of her Sickness, I framed the *Ætiology* of this kind of admirable distemper: For the consideration of her father, who at that time was sick in the same house, with most grievous Convulsive passions, kept me, that I did not with many others, refer all things to the delusions of witches: wherefore, that I might seek out the natural causes of these Symptoms, it was in the first place plainly to be suspected that this Gentlewoman had contracted hereditarily the seeds of Convulsive Distempers, which at length, about the flower of her age, broke forth into this kind of fruit: for when her blood was very much imbued with heterogeneous explosive particles, they at length (as is wont in such a disposition) began to be poured into the head, and there to be fixed: being therefore first deposited in the *Meningæ*, they induced the huge periodical head-ach; then afterwards, the same matter having accidentally shifted its place, falling down into the sincks of the throat and mouth, changed the *Cephalage* or head-ach, into a *Catarrh* or *Rhume*: and when lastly by an untimely use of the administered remedy, the defluxion stopped, the morbidick matter flowing back into the brain, brought the *Vertigo*, and then, being thrust forth on the nervous stock, it excited the aforesaid Convulsive Affections.

The reason of
the aforesaid
cause.

As to the formal Reason, or the means of generation, whereby the Convulsive matter, falling down into the nervous stock, did produce these admirable Symptoms, we may lawfully suppose, that the same being thrust forth from the Confines of the head, being yet more firm, into the spinal marrow, and its *Appendix*; and being like a malignant hrment, it first infected with heterogeneous and highly explosive particles, these parts of the juice watering the whole mass; which cleaving to the spirits, every where disposed thorow their whole *series*, and agitating them, as it were with a certain fury, did stir them up into continual explosions: When in truth, the nervous juice, as is said, was so fermented by the inflowing of the Convulsive matter, that which did otherways water the containing parts, with a gentle falling on them, and through the same did pass over the animal spirits, with an equal expansion; now the same did torment the nervous fibres, with various contractions and corrugations or shrinkings up, and did hinder both the spirits flowing in, being too much burthened with an heterogeneous *Copula*, from their due irradiation, and also variously moving those implanted in every part, did incite them, as it were with a diabolical Inspiration, so that no more obeying the Empire of the will, they ran into inordinate motions, and did renew them, translated rapidly here and there, with a perpetual reciprocation.

But, altho the heterogeneous particles, being poured forth with the blood into the brain, and thence thrust forth into the nervous stock, did not enter rightly the beginnings of all the Nerves, but chiefly, and almost only, the spinal marrow, and its nervous shoots; so that the internal *Viscera*, also the parts of the eyes, mouth, and face, remained free from any Convulsion: yet, that same explosive force being hindred by some violence, whereby it entred less in the outward members, presently like wild-fire, a way being found, it was wont to run into the *Præcordia*, and bowels of the lower belly, *viz.* because the inflowing spirits being struck with a certain fury, and requiring a larger space, in which they might exercise their madness; being excluded from one place, presently enter another somewhere open: wherefore, if that fury had been repulsed both from the members, and the *Viscera*, no doubt but it would have flown back on the brain, and brought thither madness, or as it were an epileptical insensibleness: which symptoms indeed hapned to be wanting, for that the brain of this most ingenious Gentlewoman, being indued with a more firm constitution, did take from the nervous liquor freshly instilled, whatsoever was congruous and spiritous, for its proper food, and enjoy'd it: in the mean time, it did depress all the morbid particles, into the spinal marrow, by which the involuntary motions of the members were excited, after that manner as we said but now.

Being requested to undertake the cure of this worthy Virgin; first, a light preparation of her body being made, I gave her a solutive potion of the infusion of *Senna* and *Rhubarb*, with *yellow Sanders* and *salt of Wormwood* added to it, by which she was purged twelve times with great ease; the next day I took eight Ounces of blood from her left Arm, every evening I gave her an opiate of the water, and Syrrup of the flowers of *Lungwort*, with the powder of *Pearls*: besides, once within six hours, I prescribed her to take a dose of the spirits of *Harts-horn*, in a draught of the following Julup: Take of the waters of *black-Cherries*, *Walnuts*, and the flowers of *Paony*, each three Ounces, of the Antiepileptic of *Langius* two Ounces, of the Syrrup of the flowers of the *Male-Paony* two ounces, of the powder of *Pearls* one Scruple, mix it, and make a Julup: because she could not endure much purging, *Clisters* with Sugar'd milk were made use of frequently: besides antispasmodic Ointments being applied to the hinder part of her neck, and the back-bone, we ordered often rubbing of the distempered members, with warm Wollen cloths wetted in proper Oil.

By the use of these the sick person within six days seemed to be very much-helped; for the Convulsive motions almost wholly ceased, and she could contain her members quietly in their due position, only her head sometimes by a lighter contraction was compelled to bend gently this way and that way; further she was able to stand a little, and rise out of her Chair; but when she went to step forward, she went not rightly, but obliquely on one side: At this time going away, I left her much better, and in a manifest state of growing well: But after another week, when the North-wind being high, and arisen in night-time, the Window not being fast shut, blew very much upon the sick person being in Bed, she presently taking cold, relapsed into that kind of condition, that she became obnoxious not only to Convulsive passions, but to an universal periodical Palsie: for after that she was forced to move about, turn, and wind variously, all her Limbs successively, with her head, and members by turns, bent, and thrown about here and there (as before) from morning to night; till at night these kind of motions wholly ceasing, a resolution of her members, or palsie succeeded, so that she was not able to stir either hand or foot, or any other part of her body besides, or to exercise any motive bending of the body, lying in her bed almost immovable like a stone; but being a little refreshed with sleep, about morning, as she recovered some little strength or virtue of the regular motive faculty, by bending, tho but weakly here and there, her arms, and legs, so also the involuntary and convulsive motions did constantly return, enduring from that time all the day, which again at the evening were changed into these resolutions of the Limbs.

By these it appears clearly, that the sick Gentlewoman laboured with a twofold Disease, *viz.* a Palsie, and Convulsion, and that the material cause of either, was somewhat distinct: For it seems, that the animal spirits every where abounding, being burdened with narcotick particles, were almost continually bound: besides that, in the time of sleeping, together with the nervous juice, the Convulsive particles plentifully flowing in, clove also to the spirits: for the explosions of which, the spirits being incited, produced the involuntary motions: but also at that time, the narcotic *Copula* being somewhat shaken off, they were then able in some sort to perform the voluntary or regular also: Besides the Remedies but now recited, they did carefully administer very many others, almost of every kind, *viz.* Antiscorbuticks, Antiparaleticks, Decoctions, Sudorificks, or sweating Medicines, distilled Waters, Spirits, Elixirs, Tincture, Baths, Liniments,

The Curatory
Method Observed in this
case.

Liniments, with many others; by the use of which, the symptoms were something remitted, but yet the Disease was not wholly cured, the universal Palsie soon ceased, that she was able at any time to move her Limbs, and to bend them here and there; and also the involuntary motions did trouble her but rarely, yet she continued languishing and weak; and when she being of a more fine temper, and prone to a Consumption, by reason transpiration was hindered, the recrements of the bloods being laid up in the Lungs, brought in a Cough, which every day growing worse, she at length died of a *Phtisis* or wasting.

2. *Observation.* Some years since, I was sent for to a Noble Virgin, sick almost after the same manner, and sometimes worse: For this suffer'd almost perpetually, coming by turns, involuntary motions, to wit, shakings of the head and members, or defections or movings about here and there: besides, she was afflicted with an exceeding troublesome and plainly wonderful Convulsion of the *Diaphragma* and muscles serving for breathing: for every minute of an hour, and oftner, her back-bone was suddenly bent in about its middle, and together her breast shooting out forward, and her *hypochondria* being drawn inwards, she made a noise sobbing, now double, now threefold, but still with a less and less noise: this kind of motion, and ebbing of a crashing noise, was wont to come for many hours, and so that she might be heard through the whole house; and when any short interval of this hapned, she was compelled presently to shake, or writhe together extreamly her arms and hands, and sometimes her legs and feet, and also to fling about most furiously her head, and by and by to hold her neck, as it were stiff, and immovable: and then in speaking, her tongue would be taken after that manner that she would repeat the same word very often, yea sometimes twenty times at least: when the Convulsive motions tormented her strongly in her outward members, she was free for a little while from that throatling and noise Distemper; and this space of intermission she called her time of ease; tho in the mean time her head and members were carried violently here and there, with Convulsive motions: if at any time she lay on her left side, presently a contraction of her right *hypochondrium* inwards, with a sobbing or throatling, vexed her. Within a few day, her strength being very much lost by the assiduity of the passions, she contracted so great an imbecility in her loins and joynts of her legs, that she could not stand, nor lean on her feet: her stomach, distempered either with weakness or the convulsion, returned back whatever was put into it, by vomit.

The nature
and cause of
the described
case.

In this case, as in the former, it appears clearly, that the animal spirits, not only those implanted in this or that part or region, had contracted an heterogeneous *Copula* to be shaken off by some turns, but also the spirits influencing some nerves, being imbued with explosive particles, had brought in the perpetual and wandring Convulsive motions. And when at first it hapned that the spirits so afflicted did assault not all the nerves together, nor any indifferently, but for the most part only those belonging to the *Diaphragma*, and the *Appendixes* of the spinal marrow, so that within those spaces the fury of the spirits, perpetually exploding, was limited; for this reason it hapned that the Convulsive affections being restrained in any one of those parts, did break forth more furiously straight in another; and when by their proper instinct, their motive force was imployed in one region, the same was in the mean time wont to be remitted in another. Moreover, in this sick person, the morbid matter consisting both of narcotick and convulsive particles, caused together the paralytick and convulsive Distemper.

Coming to her on the fourth day, I gave her an Emetick potion, by which she vomited seven times abundance of ropy phlegm, with yellow choller, yet without any ease: on the next day I took six Ounces of blood from her left Arm, presently from thence the blood being more impetuously carried towards the head, she complained mightily of an headach, and giddiness; But within three days, she being let blood in the foot, found her self better: she afterwards took Remedies for the Distempers of the nerves, to wit, *Spirits of Harts-horn*, and of *Blood*, *Bezoartick* and *shelly Powders*, *Julaps*, and *Electuaries*, *Antispasmodical*: by the use of these the symptoms seemed to be something remitted, but yet they remained somewhat after the manner but now described: After a fortnight, by the prescription of a certain Country-Woman, she took in a draught of Beer, six spoonfuls of blood taken from the ear of an Ass, by which she seem'd on a sudden to be cured: for forthwith all the Convulsive motions did leave, and she remained free from them 24 hours; but yet the Disease returning the next day, with its wonted fierceness, would not give place neither to that Remedy, nor indeed easily to any others: she therefore for the future, took Medicines methodically prescribed: Once within six days she was gently purged, besides she took the Powder composed of *Bezoar*, *Pearls*, and *Coral*, with the roots and seeds of *Paeony*, also an *Electuary*,

ctuary, prescribed by *Horslius* for these kind of admirable Convulsions; also *Fulup*, and *decoctions*, proper in convulsive Distempers: *Clifters* were often used, frictions ointments, and vesicatories were administred with success: within another week the sobbing affection wholly ceased, and likewise the other Convulsive motions being grown more gentle by degrees, very much remitted: growing well of these Distempers, a *Catbar* falling down in her throat, she was so much troubled, that she almost continually spit forth a sharp, and as it were corrosive spittle, as if she had had a salivation by taking *Mercury*: which kind of Remedy, indeed, hath been found to have been the last event in this case: but I wholly abstained from administring it, because both the sick, and her friends, would not give me leave.

After this plentiful and troublesome spitting had continued for many days, the Disease seem'd almost to be wholly cured: so that this noble Gentlewoman being free of her Convulsive motions, went abroad, and was well, both in strength and stomach. Only she complained, that oftentimes in a day, she was suddenly afflicted for about a minute of an hour with a shivering of her whole body; which kind of Distemper coming upon her sometimes in the night, broke her sleep: within the space of a month this symptom also, and likewise her *Catarrh* wholly ceased: But from thence she was sometimes afflicted with an extream sourness in her ventricle, and the passage of the *Oesophagus*, and sometimes also in her mouth, and pallet, that it was feared lest the inward skin being fretted, those parts should contract an ulcerous disposition; besides she was wont to be tormented often in her sleep, sometimes also being awake, with the night-mare or *Incubus*. For this I prescribed *spring* and *fall*, a gentle purge to be administred, with the use of antiscorbutick Remedies, and sometimes *Chalibiates*, or Medicines of *prepared steel*, which kind of method she observed so much to her benefit, that she was well in health for many years, and is as yet well.

Among the many Remedies which were taken against that sourness, and as it were ulcerous disposition of the pallet and *Oesophagus*, I prescribed that she should drink every morning her own Urine fresh made; this, whilst it was very saltish, was wont to give her great ease; but at sometimes her Urine flow'd from her thin and plentifully, which being nothing salt, but like to four Vinegar, from the drinking of that she received little or no benefit.

The reason of the case but now described, seems not much unlike the former, unless that in this sick Gentlewoman the explosive particles had entered into more passages of the nerves, to wit, besides the *appendixes* of the spinal marrow, into those dedicated for the office of breathing, and also by fits, into those designed for the motion of the Tongue, and almost perpetually tormented the spirits, abounding in them with rage or fury.

But that the cure of this Disease happen'd by the falling down of the sharp humor into the emunctories of the mouth and throat, we may from thence gather that the material cause of this, was the heterogeneous particles, and as it were nitrous, begotten in the blood; which, when from thence, being passed thorow from the brain, they were carried into the nervous stock, caused the aforesaid Distempers: But as soon as by the help of Remedies the more plentiful provision of that matter was hindered, and the morbid particles already produced both from the blood, and the brain, and nervous stock, were derived into those emunctories of the head, the Convulsive Distemper presently ceased, and within a short time, such a Crisis or Secretion still remaining, the perfect cure of the Disease followed.

Forasmuch as the Urine being of it self very salt, and as it were lixivial, became at some times sourish, which did not give any help, as the former, to the sourness of the throat: it may hence be gathered, that the salt particles of the blood and humors coming away by the Urine, had a twofold state or condition, to wit, of fixedness and fluidness; wherefore the Serum, imbued by them, became now of this, now of that nature: for it seems, that the Saline particles being degenerate within the mass of the blood, remained fixed, and rendred the Urine for the most part Lixivial: but those which flowed without the blood in the nervous juice, or were laid up about the solid parts, did degenerate into a flux or acetousness: and therefore from these, being derived into the emunctuaries of the mouth, that noted sourness of the mouth, and *Oesophagus* proceeded: moreover, when these kind of particles being gathered to a fulness in the nervous juice and solid parts, did swell up, and arising to a fluxion, boiled up into the blood: presently these being sent away from thence in heaps, thorow the Reins, rendred the Urine increased in quantity, sourish. But forasmuch, as the Saline particles, being of a divers condition, and that those of the same kind could not be mingled together, they mutually moved against one another, and break their forces; therefore the salt Urine, and not the four, healed the sourness of the throat. It appears

pears by a vulgar experiment, that the most sharp *spirit of Vitriol*, by the mixture of the *Salt of Tartar*, or any other Lixivial, grows very mild : yea, and yet from thence appears, that the acid humor sweating out into the parts of the mouth and throat of this Gentlewoman, came near the nature of sharp *Vitriol* ; because the fume of Tobacco, being taken at the mouth of the sick person, was wonderfully sweet, as it happens to such who have beforehand tasted *Vitriol*.

Because we treat here of admirable Convulsions, which do not ordinarily happen, and whose nature and causes lie deeply hid ; for the better illustration of these kind of Distempers we will yet shew one or two more cases no less wonderful than the former.

3. Observation. About ten years since, I visited the daughter of a certain Noble man, troubled after that manner with Convulsive motions, that some thought her possessed with an evil spirit : This virgin about sixteen years of age, fair, and well-made, yet begotten of a paralytick Father, without any evident cause, about the Winter-solstice began to fall ill. At first she was troubled, though not in any grievous manner, with an head-ach, and giddiness for many days ; then she felt, now in one of her arms, and then in another, a trembling and sudden contraction ; which kind of Convulsions returning often that day, endured scarce a moment ; the next day sitting nigh her Sister in a Chair, suddenly leaping out, she fetch'd one or two jumps, and many others successively, with wonderful agility, at the distance of many feet ; then, when she was come to the farther part of the Chamber, she stood leaping a great while in the same place, and every time to a great height ; when her legs were quite tired with leaping, she fell on the floor, and presently she flung her head here and there with wonderful violence, as if she would shake it from her neck : As soon as she ceased from this motion for weariness, presently the same fury invaded her hands and feet, so that she was forced strongly to exercise these members, by striking the walls or posts, or by beating the pavement : when by reason of shame or modesty, due to her friends, and by-standers, she did hinder her self with great violence from these motions (for all the while she was her self, and spake soberly) the Distemper being sent inwardly, she was very much infested with a mighty oppression of the heart, with a bemoaning and very noiseful sobbing ; when she would ease her self, she was forced presently, the fury being transmitted to the muscles of the outward Limbs, either to leap about, or to fling here and there cruelly her head, or arms, or also to run about the Chamber most swiftly, or to beat the ground with her feet : because these kind of vehement motions of her Limbs or Viscera, in the Tragedy of the Distemper, did mutually relieve themselves, returning as it were in a round.

The Curatory Method.

Coming the 5th day after this Lady had been sick, I gave her a Vomit of the fusion of *Crocus Metallorum*, wine of *Squills*, and salt of *Vitriol*, by which she vomited seven times cancker'd oil or choller in a great plenty, with the mixture of a sharp, and as it were vitriolic humor : The next day ten Ounces of blood was taken from the *Saphana* vein ; besides, she took twice in day, Antidotes of the powders of precious Stones, of *human Skull*, and the root of the *Male-Pæony*. By the use of these, within a week, she seem'd to be cured ; she continued for many days afterwards free from the afore-said Distempers : But after two weeks, at the time of the full Moon, she fell into a relapse of the same Disease more cruel than before ; for besides those wonderful leapings, and vehement conversions and roulings about of her head and members, she was forced besides to fetch often a most rapid course round about the Chamber : she began at this time, from the Prescripts of others, to take anti-hysterical Remedies, and Purges at certain set intervals, but without any help : At last, I being sent for, because she seemed indued with a strong habit of body ; and with a notable fierceness of spirits, I gave her a stronger Emetick, by which she vomited forth ten times, greenish choller, like to rust, with phlegm, sharp like stygian water, and she was suddenly eased : After this, I gave her every morning a draught of white-wine, dilated with the water of black-Cherries, with fows or hog-lice bruised and infused therein, and strongly pressed forth. By the use of these, she seem'd presently to be cured, and was well above a Month : And when afterwards, the Distempers being about to return, she felt at any time some fore-runners, presently by the use of a Vomit, and the expression of the *Millepedes* or *Cbeslogs*, she averred the approach of the Disease : within three months, she so far recovered her former health, that she has now liv'd for many years free from those kind of Convulsive Distempers : But from the time the Convulsive passions wholly ceased, she was sometimes troubled about the parts of her mouth, and throat, with a defluxion of a most sour humor, like the vitriolick *Stagma* ; besides, sometimes she was obnoxious to the *Pica* or longing of Women, and at some-times also to the Cough, with a discoloured spittle, threatening a Consumption,

not-

notwithstanding which, by Remedies used in these kind of Cases, she was easily cured.

As to the *Ætiologie*, or rational account of the aforesaid case, there is no reason that we should fear to refer both the Causes and Symptoms of this Disease, to the explosive Particles (the Brain being pass'd thorow without hurt) sent as a supply continually from the Blood into the Nervous Stock; which, forasmuch as they being poured forth in great plenty, were not restrained within private Mines, to be struck off onely by turns, cleaving every where, both to the implanted and flowing Spirits, forced them, as it were inspired with a Madness, to be perpetually exploded, and to grow raging here and there, by bands: so that indeed, they were not able at all to be ruled, within the containing parts; but there was need to overthrow, and to tame them; impetuously tumultuating, and apt to be carried here and there, like a Whirlwind, by some very violent and strong exercise. In truth, it was in this sick person, as it is in musical Organs, which if filled above measure, by too great a blast of wind, unless presently the passage of more Pipes be opened, the whole frame of the Organ is quickly shaken, and in danger to be brokent to pieces: In like manner in this Lady; when the Animal Spirits actuating the pipes, and the depending *Fibres* of some of the Nerves, were moved beyond their due Tenour, there was a necessity that their force should be bestowed on many vehement local Motions together, whilst they inflated above measure the Nervous Bodies: wherefore, when their Madness was hindred in one part, by and by, like Wind pent up, creeping somewhere else, it broke forth more violently in some other part.

The reasons of aforesaid case.

In this sick Person, the use of one or two Vomits, brought help once or twice, because that by it, what was lodged in the gallie Vessel; yea the *Glandula's* and *Emunctuaries*, and also about the *Viscera* of Concoction, being by this means emptied, the purging of the Blood and Nervous Juice, were more copiously drawn into the same place; therefore indeed, that the Animal Spirits flowing within the Pipes of the distempered Nerves, might be less infected by them: By this reason also, the juice of the Sows, or Hog-lice, was beneficial; forasmuch as it derived the Morbifick Matter, from the Nervous kind to the Urinary passages: Besides these Remedies, the Root, and in a great part the Branches of the Morbifick Matter being cut off, and when others, as it were antidotes, and as it were carefully Administred whatsoever was left of it; Nature at length becoming superior (as she is wont in these critical cases) sent away to the sinks of the Mouth and Throat.

Whilst I was writing these things, I visited an illustrious Virgin, who was troubled with other kind of Convulsive motions, and those universal, and no less to be admired: she was about Eighteen years of Age, handsome, and well made, and before this time, healthful; when the Pestilence raging in this Neighbourhood, she had come within the danger of its Contagion, she fell into a panick fear, with frequent swooning; the Night following, she suffer'd so great a *deliquium*, or sinking down of her Spirits, and Insensibility, that she seem'd just a dying; hardly struggling with so great an evil: afterwards, she had every day Convulsive fits, though at first, at uncertain hours, and returning after a manifold kind; But within a short time, its comings being made regular, twice in a day; to wit. they constantly returned at Eleven of the Clock, and before Five in the Afternoon, that no intermitting Fever kept more exactly its periods; yea, also the same accidents of the fit daily chanced after the same manner.

4. Observation

When she had thus been sick for three Weeks, one day I was sent for, that I might take notice of all the Symptoms, and the whole figure of the Disease; she being up about Ten in the Morning, was well in her countenance, going, and speech; she behaved her self exceeding well, so that none would ever suspect her to be sick: at Eleven of the Clock, she began to complain of a fullness of her Head, and numbness of Spirits, with a light swimming; by and by she felt a great Pulsation, and as it were the leaping of some live Animal in her left *Hypochondrium*: putting my hand on her side, I plainly perceived this Motion; then a stretching, and belching followed; which done, she was presently put to bed, and a Maid sitting upon a Pillow held her down; who during the fit, most strictly graspt the sick Person, holding her to her bosom, with her arms folded about her waist: besides, servants were ready, and her Relations standing by, who now press'd down her Belly, and *Hypochondria* rising up, and swelling to a great bulk, now held her hands and arms. The chief Symptoms of the Disease, which being excited by turns, almost divided the whole fit, were these two, viz. One while cruel Convulsions of the Bowels did infest her, so that the *Abdomen* rising up into a mighty bulk, strove against the hands of the By-standers, held upon it, that it could not be pressed down; and at the same time, her *Præcordia* being contracted upwards, the motions of her blood and heart were almost stop't: in which space of time, this Virgin, her Head falling down, with a small pulse, and almost without voice, lay night

senseless;

senseless; after two or three minutes of an hour, these Convulsions ceased: and then the sick person setting her self upright, look'd about chearfully, and for a while the force of the Disease changed into talking, and singing; both of which, she without ceasing performed most pleasantly, and most elegantly, beyond her proper capacity: with these kind of speeches, and pleasant jests, she fell upon all the standers by, that nothing in a Comedy could be more pleasant; then she uttered most sweet tunes of Musick, and more pleasant than any other could, or her self at any other time: After she had past six or seven minutes of an hour, thus jesting and singing, the Convulsions of her Bowels and *Præcordia*, and the want of speech, came upon her as before: and these soon remitting, the force of the Spirits leaping back from the inferior Nerves on the Brain, it was lastly imployed in the pleasantness of Speech, and Songs; as often (when she talkt to the by-standers) as any of them replyed any thing bitterly, or reproachfully, she fell into those most grievous, and longer continuing Convulsions of the *Viscera*. After this manner she was wont to be molested with an alternate Distemper of the Bowels, and Brain, about the space of an hour; then towards the end of the *Viscera*, the fit declining, more light Convulsions being made, they repeated three or four times, without any intermission; then these wholly ceasing, the force of the Disease brake forth into her outward Members, from whence it quickly vanished; for her Arms and Legs, for a minute of an hour, suffered leapings forth, and contractions; presently after, the sick person being taken up, left her Bed, free from all Convulsions, till a new fit returned; yea, indifferently well in strength she walk'd about the House, and during the interval of her Distemper, she chearfully performed the accustomed Offices of Life, excepting that her Stomach-languishings, all day she loathed food; in the evening, after the second fit, she supp'd moderately.

This was the present state of the Disease, in whose fits, the more clear use of some faculties, seem'd in a manner to compensate the irregularity of others: But about the beginning of her sickness, it was somewhat otherwise; for the Convulsions of her Bowels were far more grievous, and an insensibility was joyned to them; besides, in their interval, talking idly, an incongruous singing; yea, both laughter and weeping, without any known reason breaking forth, were wont to follow one another; but now the Animal Spirits being forced into longer Explosions, performed them so regularly, now this, now that, as a more commodious way was made, that they seem'd after a manner to be done by the command of the Will, and of Reason.

The reasons of
the aforesaid
Distemper.

That we may therefore, according to our *Hypothesis*, frame an *Ætiology* or Rational Account of this Distemper: In the first place it seems, that a vehement fear did drive the Spirits inhabiting the Brain and *Præcordia*, into great disorders: so that they being disturb'd out of their ranks, both the kind of Madness or Foolishness, and the frequent swooning succeeded: Further, it may be suspected, that from the same impression the hurt was carried to the Brain it self, so that its conformation being somewhat vitiated, the Heterogeneous and Morbific Particles were admitted, together with the Nervous Juice: then, although the spirits at the beginning, being confused and troubled, after their short inordinations, at last recovered themselves, and performed the wonted offices both of the animal and vital Function; yet by reason of the taint, impressed on the Brain, the Heterogeneous Particles being constantly admitted, cleaving to those Spirits, induced explosive endeavours, as soon as the spirits were filled to a plentitude with the extraneous *Copula*, they being irritated, entred into Convulsive explosions for the shaking, or striking it off.

About the beginning of the Disease, when both the disposition of the Brain, and the Spirits inhabiting it, was more perverse and vicious from the fresh received hurt, a fullness of the Heterogeneous *Copula* sooner happened, and so its explosion following more often, and more inordinately, was dispatched with greater Tumult; but afterwards, when the hurt of the Animal Regiment abating, the supplements of that *Copula*, even as the Nervous Liquor, were daily brought in with an equal dimention, the explosions of the Spirits being made regular, and more mild, observed their just periods or set times.

That she felt upon the approach of the Fit a fullness, and as it were an Inflation in her Head, with an heaviness, and dullness of the Spirits; the reason is, because at this time, the Spirits Inhabiting the Brain, being now prepared for Explosions, were wont first of all to be moved, and as it were to swell up; then that Pulsation in her left *Hypochondria* succeeded; for that the Spirits inhabiting the Nervous foldings and *Fibres*, thickly planted about the Spleen, began to be Exploded: afterwards, when the Spirits flowing, both within the Mesenterick and Cardiac Enfoldings were Exploded together, those elevations, and as it were leapings up of the *Abdomen*, and *Thorax*, were induced: and when in this Distemper the Motions

tions of the Blood and Heart were almost wholly stopped, therefore there was a small, and almost no Pulse, and she became speechless, and in a manner senseless.

The Convulsion of the *Viscera* and *Præcordia* remitting, a Prattling and Singing succeeded; because a falling down, or removal of the Spirits as yet exploded, being made from the Nervous Stock into the Brain, it changed the Convulsions into an exaltation of the fancy, and more ready exercise of the Phantasm, or Representation of the Imagination: So long as the Spirits within the middle of the Brain, are regularly and orderly Exploded, they bring forth the Acts of the Habits and Faculties so much more noble, and as it were above the strength and tenour of Nature, as in this sick Gentlewoman: but on the contrary, when the Explosions of the Spirits in that Region happen to be inordinate, they cause for the most part foolishness; or at least, the exercise of their powers are incongruous and absurd.

The Convulsions of the Bowels, and the phantastick Actions, reliev'd one another mutually, and by turns; because plenty of Spirits being disposed to be struck off, made their tendency, as it were, with a direct and reflected waving or undulation, now on this part, now on that, by turns: then lastly, when they were almost all Exploded, the more often Convulsions of the *Viscera* were stir'd up; and when a small handful onely remained to be Exploded, that being at last excluded both from the Head and Bowels, it ran forth into the spinal Marrow, and employed the last assault of the Disease in the Convulsions of the Arms and Legs.

There yet remains one great difficulty in this Case, why the Fits of this Disease were always repeated exactly at set hours, and yet had so unequal Periods; to wit, that the coming of the first, was onely but six hours before the second; and then the return of the next, did not happen but in Eighteen hours space. For the solving of this, it is to be supposed, that these Fits did depend upon the Nervous Juice being stuffed to a Plenitude with Heterogeneous Particles; which Particles were altogether conveyed thither from the bloody Mass, and the blood did drink up the same from the nourishing juice, sent as a supply from the Bowels: These being thus supposed, we must consider, in what space of time the Bloody Mass is filled with those Morbific Particles, and then in what measure it pours them forth into the Nervous Liquor. As to these, that it may the better appear, after what manner it was done in the case of this sick Person, you must know, that she took in Twenty four hours space onely at one time a full Meal: to wit, after the second Fit was ended she Supped moderately about Seven of the Clock; the rest of the day wanting an Appetite, she hardly took any Food: therefore it is probable, that the Morbific Matter was poured forth, together with the Nutricious Provision, into the Bloody Mass; chiefly in the Night time, and that more plentifully, than that all could presently be derived into the Nervous Liquor: The Heterogeneous Particles which are first conveyed from the Blood, newly satisfied, into the Nervous Liquor, being heaped up to the fulness, did excite the first Fit, the coming of which therefore was longer delayed, because both one space is required wherein the Blood, and then another, wherein the Brain and Nerves are to be filled: after this Fit was over, because the Blood yet full, containing in it self more Particles of the same kind, pours them suddenly on the Nervous Juice, therefore the other Fit is induced within thrice the space of the former: but this being ended, because both the Bloody Mass, and the Nervous Juice, are wholly freed from their burthen, the sick Person finding her self better than at any other time, took her food greedily enough; but after that when to the next following Fit, first the Bloody Mass, and then the Nervous Juice ought to be filled with the Morbific Matter, therefore Ten hours are required for this double task; but forasmuch as there is onely need for the second Fit, that the other Particles should be derived from the Bloody Mass yet full, into the Nervous juice, therefore for this Effect, a much less space doth suffice, viz. of Six hours,

After I had seen this Lady, who had laboured for many Weeks with these kind of Periodical Fits, I order'd, that Three hours before the second Fit, Ten Ounces of Blood should be taken out of the Vein on the Foot; which being done, the coming of the Fit in the Evening being expected, quite left her, neither did it return at all afterwards; but the other Fit observing its former time, daily returned till the Patient being let Blood a little before its coming, remained that day free from the Disease, which however returning the day after, according to the same manner, exercised her for many Months: In the mean time, because the cold of the Winter was very great, she forbore for some time the use of Remedies: but the Spring coming on, this honourable Lady being brought to Oxford, was Cured by the following Method.

The Curatory
Method.

First I gave her this Cathartick, and I took care, that it was repeated every sixth or seventh day. Take of the *Sulphur of Antimony* six grains, of *Mercurius dulcis* one scruple, of the *Refine of Julup* gr. iv. of *Ginger* gr. vi. let them be beaten together in a mortar, then add of the *Conserves of Violets* i. dram, make a *Bolus*: It was wont to provoke two or three Vomits, and three or four stools. The flux of her Terms came constantly in great abundance, at the set times: wherefore, when the blood seem'd very plentiful, and hot, I order'd *Phlebotomy* twice or thrice in the midst betwixt the times of her Terms: Besides, every day that she did not Purge, she took twice in a day 4 Pills of the following mass, drinking after them a little draught of the Julup below prescribed. Take of the *Roots of the Male-Pæony* half an Ounce, of *Virginian Snakeweed*, *Contraerva*, *Cretic*, *Dittany*, each two Drams, of *human skull* prepared, one Dram and a half, of an *Elks claw* one Dram, of *red Coral* prepared, of the *Powder of Pearls*, each one Dram, of the *salt of Wormwood* two Drams, of the *salt of Corral* one Dram; with what will suffice of the *Syrrop of the flowers of the Male-Pæony*, make a mass.

Take of the water of the flowers of the *Male-Pæony*, of *black-Cherries*, and of *Walnuts*, each four Ounces, of the *Antiepileptic of Langius* two Ounces, of the *Syrrop of the flowers of Pæony* an Ounce and a half, of *Castor* tied in a knot, and hung in the glass, one Dram, mix them, and make a Julup.

When she began to loath the Pills, they being omitted, she took twice a day, to wit, in the Morning and the Evening, about one Scruple of the following Powder, in a spoonful of Julup, drinking after it four or five spoonfuls of the same. Take of *Bezar-stone*, of either *white Amber*, of *Pearls* prepared, of *red Corral*, each one Scruple, of *human skull* two Scruples, of the root of *Virginian Snakeweed*, and the *Seeds of Rue*, each half a Dram, mingle them, and make a Powder, let her take one Scruple Morning and Evening, with a Dose of the above-prescribed Julup.

Then, when also this Medicine began to be tedious to her, she used the Pills, or the *Elixir proprietatis*, and also, sometimes for many days, the *Spirits of Harts-horn*: At last, she began to be helped by that Powder, being daily taken, for some space.

In the mean time, whilst this method of healing was ordained, her hair being shaven from her head, it was covered only with a thin covering: she wore upon her Belly an *Hysterical Plaister* mixed with *Galbanum*: for her ordinary drink, she took a *Bochet of Sarja and China*, the roots of the *Male-Pæony*, and other proper things, infused in *Spring-water* and boiled. Within a month the fits were something remitted: then, being by degrees made gentler and lesser, at length they almost quite ceased: unless that at the time of her Terms, one or two fits of the Disease was wont to trouble her: Further she labour'd with an almost constant giddiness, and queasiness of stomach; in the middle of the Summer she drank *Astrop-waters* for a fortnight, and was perfectly well.

But as for the means in general, to be shewn for the Cure of these admirable Convulsions, it will not be easie to assign, either fit Remedies for this Herculean Disease, or a certain method of Cure, approved by often experience: for besides, that these like cases are seldom met with; it is likewise observed, that the same Medicines which at this time were helpful to this sick person, being given to another, or to the same, helpt nothing at another time: The reason of which seems to be, because the cause of the Disease consists in the discriasie, or evil disposition of the nervous juice, which Liquor is not always perverted after one and the same manner: But by the manifold combination of the Salts and Sulphurs, it gets a morbid nature of a various manner and kind, and oftentimes changes it: wherefore, in the most grievous Distempers of this kind, not the vulgar Medicines, taken from the Shops or Dispensatory, are to be prescribed, but magistrals, as cause arises, according to the appearances of the admirable symptoms. A gentle Vomit, Purge, Blood-letting, ought in the first place to be ordained, and to be repeated, as often as shall seem fit. As to specifick Medicines also, and appropriate in these cases, when the chief Indication shall be, to mend the temper of the Nervous juice, you may try many, and by their effect judge of their virtues: Therefore it may be lawful to try what the Remedies indued with a Volatile or Armoniac Salt may effect. For this end, the spirits and salts of Harts-horn, Blood, Soot, and the Flowers and spirits of *Sal-Armoniac*, are taken: These helping nothing, you must come to Chalybiats or Steel Medicines; the tinctures and solutions of Coral and Antimony are given: which kind of Medicines are exhibited in such a dose, and form, and so often, that some alteration may be made by them, on the whole blood or nervous juice: Further, if success shall fail in such like, you must then proceed to *Alexipharmaca*, which help against Poysons, and the malignancy impressed on the humors, to wit, to institute from these, decoctions, and distilled waters of vegetables, powders, conserves, and other preparations: and to compound variously some with others, and to

to administer them diversly. It is likely, that those kind of Medicines which are wont to be helpful to such as are bitten by a Viper, or a mad Dog, or that have taken Wolfs bane, or Poyson, may be useful also in the aforesaid Convulsions. It may be lawful here, according to the example of *Gregory Horstius*, in his tract of the malignant Convulsive Disease, and also of wonderful Convulsions, to prescribe magisterial Remedies in the form of a Purging Electuary, and also of a Powder, and Convulsive Antidote, and to compound them variously, partly of simple *Alexipharmicks*, or poyson resistors, and partly of *Antiepilepticks*, or things good against the falling Evil.

CHAPTER X.

Of the Passions commonly called Hysterical, or Fits of the Mother.

THE hysterical passion is of so ill fame among the Diseases belonging to Women, that like one half damn'd, it bears the faults of many other Distempers: For when at any time a sickness happens in a Womans Body, of an unusual manner, or more occult original, so that its cause lies hid, and the Curatory indication is altogether uncertain, presently we accuse the evil influence of the Womb (which for the most part is innocent) and in every unusual symptom, we declare it to be something Hysterical, and so to this scope, which oftentimes is only the subterfuge of ignorance, the medical intentions and use of Remedies are directed.

The Passions, which are wont to be referred to this cense or order, are found to be various and manifold; which rarely happen in divers Women, or which come wholly after the same manner: The most common, and which commonly are said to constitute the formal reason of the Hysterical Distemper, are these, *viz.* A motion in the bottom of the Belly, and an ascension of the same, as it were a certain round thing, then a belching, or a striving to Vomit, a distention, and murmur of the *Hypochondria*, with a breaking forth of blasts of wind, an unequal breathing, and very much hindered, a choaking in the throat, a *Vertigo*, an inversion, or rolling about of the eyes, oftentimes laughing, or weeping, absurd talking, sometimes want of speech, and motionless, with an obscure or no pulse, and deadish aspect, sometime Convulsive motions in the Face and Limbs, and sometimes in the whole Body, are excited: But universal Convulsions rarely happen, and not unless this Disease be in the very worst state: because, for the most part, the Tragedy of the Fit is acted without contraction of the members, only in the inferior Belly, *Thorax*, and Head, to wit, in some of them, or successively in all: Women of every age; and condition, are obnoxious to these kind of Distempers, to wit, Rich and Poor, Virgins, Wives, and Widows: I have observed those symptoms in Maids before ripe age, also in old Women after their flowers have left them; yea, sometimes the same kind of Passions infest Men; as plainly appeared by the example already shewed.

As to the causes of those symptoms, most ancient, and indeed modern Physitians, refer them to the ascent of the Womb, and vapours elevated from it: The former opinion, although it plead antiquity, seems the less probable, for that the body of the Womb is of so small bulk in Virgins, and Widows, and is so strictly tied by the neighbouring parts round about, that it cannot of it self be moved, or ascend from its place; nor could its motion be felt, if there were any: as to that vulgar opinion, or reason taken from the vapours, we have often rejected it as wholly vain, and light, for just reasons elsewhere: But we judge, the Passions but now described, do neither always, nor at all proceed from the ascent or the vapours of the Womb: and that indeed, other very famous Physitians have already determined: For in times past, *Charles Piso*, and of late the most learned *Highmore*, have vindicated the Womb from all fault; and the Passions, which are commonly call'd Hysterical, are thought by this latter to arise from the blood, most impetuously rushing on the Lungs; and by the other, from a serous colluvies heaped together near the origin of the Nerves. How probable this latter opinion doth seem, shall appear from what follows: But as to the opinion deliver'd by Doctor *Highmore*, concerning this thing, though it be far from our custom to contradict any ones opinion, and that it is almost unlawful for me

to dissent from this famous man: yet, because our Pathologie standing on a contrary basis, (viz. the cause of the Hysterical Distemper being imputed more immediately to the nervous stock, than to the blood) will seem to be only asserted, unless we shew the reasons which combat against that hypothesis; and for ours, therefore taking leave, here we will try more exactly either opinion, put as it were in a ballance.

Doctor High-
mores Opini-
on Examined.

In the fit therefore commonly called Hysterical, this famous man supposes the blood, for that it is thin, flatulent, and with a certain effervescency, to rush too much in heaps, into the pneumonic vessels, and the vessels of the heart, and in them to broil up impetuously, and so to stuff up the Lungs, and very much to aggravate them, that neither they can exercise their motion, nor that the blood can be drained from the bottom of the heart: Hence, from the blood stagnating in the *Præcordia*, a great oppression, difficult breathing, and often none, with a melting of the vital spirits, were wont to be inferred: then the *diaphragma*, that it might give place to the Lungs, more and more distended; and that breathing at least might be some way made, is carried downward, with a mighty and long continued *Diastole*, and so by pressing down the Intestines, it lifts up the *abdomen*, and *hypochondria*, and feigns a motion as it were the arising of a Globe: But afterwards, the vital function labouring after this manner, the animal faculty arises in its aid; wherefore, a necessity of motions in various parts urging the animal spirits, being driven impetuously into the beginnings of the nerves, produce divers manners of Convulsions, running here and there. The Author endeavours to confirm this Opinion, by the great help in this Disease had by taking away the bloody excretion, both from things helpful, and things hurtful in this Passion.

But though I cannot but praise this Doctrine of the suffocation of the Womb, as very ingenious and cunningly wrought; yet that I do not consent to it in all things, some reasons of great moment clearly hinder me. Truly I confess, that I do not understand, how in some Hysterical persons, to wit, who are of a more frigid temperament, and are often troubled with the Pica, and longing Disease, the blood should so immoderately boil up in the Lungs, without any conspicuous notes of its growing hot, in some other place. I have known young maids, by reason of the green sickness, as it were without blood, to wit, whose blood indeed being without life, did remain without any exercise in the heart, and was from thence difficultly enough drawn forth into the Lungs, who yet were grievously obnoxious to the Passions called Hysterical: Certainly it is not probable, that the blood of these persons growing immoderately hot, should rush impetuously into the Pneumonick vessels, and should stuff up their pores and passages very thickly, when in the mean time such become short-breath'd, by reason of the absence of the blood from the Lungs, or its difficult admission to them: Besides, by what means comes it to pass, that this violent course of the blood into the Lungs, which is supposed to be made in this Fit, brings forth no Inflammation in them? For that the blood, being too much heaped, or rapidly put into any part, is easily extravasated, and is wont to excite an Inflammation hardly to be shaken off. From whence is it therefore, in the Hysterical Distemper, the blood entering violently into the Lungs, and distending them, does not cause a peripneumonie or Impostume of the Lungs? Or wherefore the Distempers, as it were Hysterical, come not on an inflammation of the Lungs, otherwise caused? Wherefore it seems improbable, that the blood swelling up, with its proper anger or heat, should rush into the Lungs, and by stuffing them, renders them too immovable, and so secondarily and consequently induce Convulsions of the *Diaphragma*, and other parts: but it may rather seem, that by reason of the *Diaphragma*, and other organs of breathing, being first affected with a Convulsion, the blood should be forced to stagnate in the *Præcordia*: Besides, it may be observ'd, that the Lungs are not always afflicted before other parts; for oftentimes the Convulsive symptoms begin elsewhere, and not rarely bear the region of the breast wholly untouch'd: Because in some, the *Vertigo*, and Coruscations or sparklings of the eyes, begin the fit; to which succeed either weeping, or laughing, or convulsive motions of the Limbs, without any straitness of the breath, or oppression of the heart: In others, before respiration troubles them any way, a swelling in the bottom of the belly, with a vomiting and rumbling of the belly, begins and often ends the fit; so that the difficulty of breathing oftentimes follows these symptoms at a great distance, and is wont to be prevented by the tying strictly of swathing-bands about the *Hypochondria*. Moreover, it seems, that this ascent as it were of a certain round thing, from the *Hypogastrium* or lower part of the belly, can never proceed from the depression of the *Diaphragma*; because in the Hysterical fit, this part is not always pressed down towards the lower parts, but oftentimes drawn up to the higher parts, and drives the Lungs upwards, so that the spirit or breath being almost shut forth, threatens the danger of Choaking. By these, and other reasons, we are at length per-

perswaded to that opinion, that the Distemper named from the Womb, is chiefly and primarily Convulsive, and chiefly depends on the brain and the nervous stock being affected, and whatever inordination, or irregularity from thence happens, about the motion of the blood, is only secondary, and is made dependently by the Convulsions of the Bowels.

The Hysterical Distemper chiefly belongs to the Brain and nervous stock.

But that this doth consist within the bounds of the head, both the comparing of the symptoms, which happen in the living; and the Anatomical observations of the dead, clearly shew; because we may observe, that this Distemper often takes its rise from a sudden fear, great sadness, or anger, or other violent Passion, in which the spirits inhabiting the brain are chiefly affected besides, to some an ill manner of Diet, and various accidents whereby the humors being vitiated, are headed more plentifully within the head, at first brings this evil. Yea, the manner of the fits clearly evinces the same; forasmuch, as a fulness of the head, a *Vertigo*, a sparkling of the eyes, a ringing noise of the ears, begin in many the Hysterical fit, and often conclude it: Besides I have opened some Women dead of other Diseases; tho while they were sick, very obnoxious to Hysterical Passions, in whom the Womb being very well, I have found in the hinder part of the head, the beginnings of the nerves, moistened and wholly drowned with a sharp serum, as shall be more largely declared anon.

Having weighed these, and other reasons, we doubt not to assert the Passions commonly called Hysterical, to arise most often, for that the animal spirits possessing the beginning of the Nerves within the head, are infected with some taint; to wit, they being either acted or brought into Confusion, or being tainted with vitious humors; get to themselves an heterogeneous and explosive *Copula*, which they carry far away with themselves, into the Channels of the Nerves: and when the same spirits are filled to a plenitude, with that *Copula*, thorow all their series or orders, either of their own accord, or being occasionally moved, they enter into explosions, and so stir up Convulsive motions: But that such a *Copula* adhering to the spirits, is chiefly derived together with them into the interior nerves; the reason is, because in this passage towards the *Præcordia* and *Viscera*, the animal spirits, by reason of the Distemper of the mind, are very much disturbed: wherefore, they more easily admit any evils brought from another place, and more readily conceive irregularities. For the animal spirits, chiefly for this occasion, contract a Convulsive disposition: forasmuch as they, from a violent impression, are perverted out of their courses, and their wonted manner of influence, and acting; hence they not only repeat their inordinations, but also receive the heterogeneous particles into their embraces, and more easily combine with them: Wherefore, forasmuch as the animal spirits, running thorow the nerves of the wandering pair, and intercostals, are continually entangled with all perturbations both of the concupiscible, and irascible Appetite, it is no wonder, if they acquire a Convulsive disposition before the rest.

The cause of the Disease most often begins about the beginnings of the nerves.

It being supposed (which indeed ought to be supposed) that the animal spirits have contracted an heterogeneous and explosive *Copula*, now the nervous *origines*, and carried it together with it self into the interior nerves, and spread it thorow all their passages, it will not be hard to assign the reasons of the hysterical fit, and of all its symptoms. For first of all, the Disease being ready to fall upon one, oftentimes the *Vertigo*, a rolling about the eyes, and a certain inflation of the brain, as it were previous skirmishing are stirred up, because the whole band of the spirits, being in readiness for explosions, the more light companies of them leaping back towards the brain, are first struck off; then presently a perturbation succeeds in the bottom of the belly or *hypochondria*, for that the spirits within the enfoldings here and there, are next disturbed: For we have elsewhere shown, if at any time the animal spirits are exploded, in a certain whole Series, those which abode in the extream parts, first of all enter into that assertion: Wherefore the beginnings of this Disease, are found to be, for the most part, in the Head and Bowels: but that the Convulsions are first perceived, now in the bottom of the Belly, now in the *Hypochondria*, the reason is, because the morbid matter is sometimes carried by the passage of the intercostal nerve, into the utmost mesenteric enfoldings; but sometimes the same, being slid down, not beyond the ends of the wandering pair, subsists much nearer, to wit, about the enfoldings of the spleen or stomach.

The same cause afterwards disposed, thorow the whole passage of the Nerves.

When therefore the animal spirits (as hath been shown) within the nerves of the wandering pair, and intercostals, are imbued from their *origine*, even to their utmost ends, with an heterogeneous and explosive *Copula*; they at length, either from meer fulness, or by an irritation somewhere made, are stirred up to explosions; in which if any spirits leap forth towards the middle of the brain, they induce the *Vertigo*, the Inflation and other prævious Accidents of the Head: but the Spirits inhabiting the other

The reason of the Hysterical symptoms unfolded.

other Extremity of the Nervous Trunk, viz. the Mesenteric Enfoldings begin chiefly to be Exploded, which presently by their letting off, compel the lower parts of the *Hypogastrium* to be lifted up, and contracted upwards, and so induce the Ascension of a certain bulk, as it were of the Womb: then, when the upper parts of the Enfoldings of the Mesentery, are by degrees intangled with the same Distemper, and the Bowels annexed to the same are Elevated, and drawn forcibly towards the upper parts, the violent swelling of the *Abdomen*, as it were with a certain leaping forth, succeeds: Further, the Ventricle is not onely Elevated, by changing its place; all its *Fibers*, to wit, the Direct, Oblique, and Transverse, being affected at once with the Convulsion, is often distended like a blown Bladder: hence very often Vomiting, or at least a rumbling and murmur of the *Hypochondria*, are excited: but as soon as the Spirits being Exploded with a certain series, it comes to the Region of the *Thorax*, the *Diaphragma* being drawn together, with an huge Diastole is sometimes depressed, and so meeting with the Ascension of the *Viscera*, causes an Inflation, and high Intumescency or swelling up, with a mighty struggling: so that the laces of those in this Distemper must be forthwith loosened, or else they are in danger of falling into a Trance: In the mean time, the *Diaphragma* being so depressed, and its Diastole continued, the Blood remains almost immovable in the *Præcordia*; and so by its Stagnation, causes a great Oppression, and very often a failing of the Vital Function: Further, the Convulsion of the *Diaphragma* happens sometimes towards the upper parts, and so that driving the Lungs upwards, induces a violent Systole, and protracted longer than it should be; and when by this means the Blood is driven forward into the Pneumonic Vessels, and is not at last received from the bosom of the Heart, it stagnates there, and besides in the whole Body; from whence the oppression of the Heart, and oftentimes a swooning, yea sometimes a want of Speech, and Motion, now with a blewness of the Face, and now with a dead Aspect follow: After these things are acted in the lower, and middle Region, at length the Distemper reaches to the Head, by the Passage of the Nerves, as it were a fiery inkindling, and the Spirits being there Exploded, leaping now towards the middle of the Brain, produce a swimming in the Head, and often symptoms very like the *Epilepsy*; sometimes the Spirits there Exploded rush into the beginnings of the other Nerves, and there stir up the like Explosions; wherefore Hysterical people, towards the end of the Fit often Laugh, or Weep, or talk idly; sometimes the parts of the Face and Mouth, yea sometimes the Arms, and other Members are troubled with Convulsive Motions; and so when at length all the Spirits which had contracted an Heterogeneous *Copula* are Exploded, the Fit ends; but presently after, matter for another Fit begins to be gathered together.

From whence
the diversity of
the symptoms
happens.

It sometimes happens, that the Convulsive Disposition is not drawn out so long and largely; for besides that, oftentimes the Nerves onely of the wandering Pair, and the Intercostrals are troubled with it, that neither the Brain, nor the outward Members are at all molested; yea sometime, neither the Interior Nerves themselves are possessed with the Morbific Cause thorow their whole Processes: for the Convulsive Disposition (as we but now intimated) oftentimes arrives not beyond the Enfoldings of the Spleen or Stomach, and then the Fit beginning from the Inflation of the *Ventricle*, or left *Hypochondrium*, is thought to arise not from the fault of the Womb, but of the Spleen: which kind of Distemper by and by being brought to the *Thorax*, and there involving the *Diaphragma* and Lungs with a Convulsion, stops Respiration, and the motion of the Heart, or in some manner prevents it: but then from thence the Fit passes over; now with, and now without a great Perturbation of the Head. These things happen indeed after a various manner, according as it happens that the Morbific Matter, or Explosive *Copula* descending from the Head is gathered together, as it were heaps of Gunpowder, more or less, now in this, now in that part. But concerning which matter, by what means the same being brought forth in the Head, first Affects the beginnings of the Nerves and so constitutes the Procatartick, or more remote cause of the passion called Hysterical, now remains next to be inquired into.

The more remote
cause of
the disease, sub-
sists, either
nigh the be-
ginnings of the
Nerves.

As to the Morbific Matter, or Explosive *Copula* which cleaving to the Spirits, flowing within the Head, and with them derived into the Nervous Passages, is often the cause of the Distempers commonly termed of the Womb; we say, that this, as in other kinds of Convulsions, is the Heterogeneous Particles poured forth from the Blood, which yet are wont to be affixed to the Spirits, flowing into the beginnings of the Nerves, chiefly for two Causes: to wit, either by the fault of the Spirits themselves, or by the force of the matter it self, instances of either kind are ordinarily met with. It sometimes happens, that the Animal Spirits, planted within the Brain, and in the passage leading from it, to the *præcordia*, are very much disturbed by a sudden Passion, as of Fear, Anger, Sadness, &c. and forced into disorders, and that by that means they being driven out of their orders, do acquire to themselves Heterogeneous Particles, where ever met with; and

and combine with these, that by and by for that reason, they acquire an explosive disposition, as we have already declared. Further, in the Second place, sometimes the Morbific matter it self, being made more fierce and strong, in spite of the succour of the Animal *Economie* or rule, is poured forth into the Brain, and its Appendix, from the Bloody Mass, which cleaving fast to the Spirits, presently disposes them into Explosions: This is ordinarily discerned in the Evil Crises of Fevers, also in some Malignant Distempers; also in Scorbatic and other Cronical Diseases ill cured. An ill or weak Constitution of the Brain, or Nervous Stock, whether it be Hereditary, or acquired, by reason of an ill manner of living, very much cherishes these causes. For in bodies so disposed, both the Animal Spirits, from every light occasion, are moved in Confusion; and the passages of the Brain and Nervous System, more easily lye open; for the running in of the Heterogeneous and Explosive Matter. In truth, for this reason Women are more obnoxious to Convulsive Distempers than Men, and some Women than others, as we will shew more largely hereafter.

But although these kind of Passions of Women, called Hysterical, most often proceed from the fault of the Head, or from the Morbific Cause arising within the *Encephalon*; Or near the yet sometimes such Distempers are stirred up by reason of a Cause beginning some where else, *viz.* Now in the Womb, now in the other Bowels: and of this Convulsive Pathologie, there are chiefly Two Heads, *viz.* *Womb, or other Inwards.*

1st. Sometimes it happens, that a Tumour, or an Ulcer, or a Congestion of sharp Humours, arises in the Membranous parts about the Womb, or planted about the other *Viscera*, and often irritates the parts so Distemper'd, by reason of the breaking of the Union into painful Convulsions: then so far as the Animal Spirits placed round about, and those inflowing are moved into frequent disorders, they at length getting to themselves Heterogeneous Particles, sent either from the Distemper'd part, or from some other place, are disposed to Convulsive Assaults; and when first of all the Convulsive Motions happen onely in the Neighbourhood of the Affected Place, to wit, that the Bulk ascending in the lower part of the Belly, or its swelling up be onely perceived; afterwards they are propagated by the passage of the Nervous Bodies, and by the consent of the Convulsion there begun, leasurely into the other *Viscera*, of the lower Belly, then to the *Præcordia*; and lastly, into the Head it self: and the Distemper being thus by little and little dilated to the Spirits inhabiting the Brain: they moreover, having gotten in their proper Sphear, an Heterogeneous *Copula*, retort the same back to the *Viscera*, and so the Morbific Cause being made reciprocal, is begun at either end of the Nervous Trunk. Some time past I have seen a Noble Virgin, in whom a small Tumour arising, with most cruel pain below the *Os pubis*, did stir up huge Convulsions, first in the lower Belly, and afterwards ascending to the *Præcordia* and Head, were at length stretch'd to the outward Members: for once or twice in a day, after that great Pains did Torment her in the Affected part, the *Abdomen*, and by and by the *Hypocondria*, were wont to be lifted up: then difficulty of Breathing, 'on an Insensibility succeeded, and presently the Distemper being brought outwardly, most horrid Convulsions and Contractions of the Members and Limbs followed. Sometimes it also happens, that Convulsive Symptoms are induced in Child-bearing Women, by reason of some hurt or evil brought to the Womb: *Harvie* relates, That wonderful Convulsions were caused by the injection of some sharp thing into the Womb: So sometimes, though rarely it happens, that a Morbific Matter, or Explosive *Copula* is fixed to the Spirits dwelling about the Extremities of the Nerves, and near the Womb, immediately from the place there Affected, and without fault of the Brain.

There yet remains another case, or manner of Affecting, by which the Convulsive disposition is produced from the fault of the parts, lodg'd at a great distance from the Brain (though in the mean time, the Taint, which is the cause of this Distemper, is often mediately Communicated to the Brain it self) to wit, when at any time the Nervous Juice is hindred somewhere in its Motion or Circulation, from thence stagnating in the Nervous parts, and loading them, does often bring in a Convulsive Disposition: So, when some usual Evacuation, whereby the Superfluities of the Nervous Liquor, were wont to be sifted forth, is stopp'd, as from Issues suddenly shut up, or old Ulcers dried up without a Purge, many fall into Convulsive Distempers: Yea, it may obtain here some place, what is wont commonly to be noted for a Cause of the Hysterical Passions in Maids and Widows, to wit, the untimely restraint of the Seminal Humour, which ought to be bestowed about the Pleasure of *Venus*; at least, if they receive help from the state of a Conjugal Life, it therefore happens, because the Restagnations of the Nervous Humour, which often fix a Taint to the Brain and Nervous stock, by this means are prevented: Moreover, the Nervous Juice flows back towards its beginning, because its Passage is somewhat shut up, by a swelling or Cancerous Tumour.

2. Or by reason of an obstruction of the Nervous juice.

Tumor. Lasty in this City, a notable instance of this kind of Distemper hapned, *viz.* A certain Maid of Twelve years of age, had contracted an *hernia* or burstness, hence by the order of her Mother, she wore a Truss ill fitted, for a fortnight, not without great pain and torment, a little hard knot much pressing upon the *glandula's* of the Groin: within this space (when before she was perfectly well) she began to complain of a giddiness and heavy dulness of her head; and so a little after she felt Convulsive, and as it were Hysterical Distempers, frequently falling upon her; together with it great swellings arose behind her ears, and in her neck of the same side, to which she was never before obnoxious in all her life. It is not to be doubted in this case, but that from those *Glandula's*, which are the emunctuaries, or sinks of the nervous Liquor, being too much pressed together, the superfluities of that humor, wont to be sent away from thence by the Lymphatic Vessels, restagnating in the head, brought forth those evils; because the arising of the aforesaid symptoms so suddenly and manifestly followed upon the wearing of that Truss upon the Groin, that even her Mother laid the cause of the Disease upon that occasion. Besides, also I have observed in others, the recrements of the nervous humour, being somewhere stopp'd in their course, restagnating towards the head, have not only brought in Convulsive symptoms, but from thence the *Kings Evil*.

Objections against the aforesaid hypothesis answered.

So much for the formal reason of the different original of the Distemper called Hysterical; as also of the *genuine* causes of its symptoms: Out of which, it seems to appear plainly, that those passions do not depend always on the Womb, but much more often on the fault of the brain, and of other parts of the nervous stock: But many things are objected against these; which according to the old opinion, cast all the blame on the Womb: to wit, it seems so to be done because the assault of this Disease invades almost only Women, yea and Women that are not well about their Womb, *viz.* Child-bearing Women, or such who have their Courses stopt, are chiefly obnoxious to it: Besides it may be argued from things helpful for it, because a Plaitter worn upon the lower part of the belly, also a strict girding of the belly and *Hypochondria*, by which the ascent of the Womb may be hindred, do not seldom drive away the fit, just falling on them; this also shews it, that sweet things held to the Nose brings on the fit, and stinking things drive the same away, it is said to happen quite contrary, if the same things be laid to the belly or privy member.

That we may wipe off these objections, we say first, that the symptoms, which seem hysterical, do not only happen to Women: for we have shown already, by the History brought by us, that a certain man has been obnoxious to those kind of fits, with the ascention of a bulk in the bottom of the belly: but that Women are much more often troubled with those Convulsive Diseases than men, two reasons may be shown, *viz.* First, for that their animal constitution is much weaker: to wit, they have the brain and nerves softer, and of a less firm texture, that they are not able to suffer any thing strongly, or to resist every injury; also the animal spirits in them, being more prone to flight and distraction, more easily admit an heterogeneous and explosive *Copula*: from hence Women, from any sudden terror or great sadness, fall into mighty disorder of spirits, when men from the same occasion are scarcely disturb'd at all. Secondly, Women more readily receive the Convulsive disposition, because they gather a more plentiful heap of the morbid matter: for that, whilst they lead for the most part a sedentary Life, the blood, for want of ventilation, becomes more impure; besides in this sex it originally abounds with heterogeneous and fermentative Particles: wherefore it is convenient for it to be more often purged by the flux of their Courses; by which notwithstanding, not always what is extraneous and incongruous, is wholly cast forth from the bloody mass, but that there remains that which being poured on the brain and its appendix, as occasion is given, becomes the cause of the Convulsive Distemper: Moreover, when the menstrual flux, being stop'd, a Convulsive disposition is occasioned; it is not therefore to be thought that such a Distemper is rais'd up from the Womb, but that the bloody mass, being more than usually imbued with heterogeneous Particles, carries them, together with the nervous juice, to the head: yea, chiefly for this reason also, Child-bearing Women are found obnoxious to the Passions, as it were Hysterical; for besides, that the membranes of the Womb being hurt, a Convulsion there begun, by reason of the felt trouble, creeps upwards, and is at last communicated to the head; it most often happens, that the blood being infected, by the terms being retained, grows hot with a Feverish burning, and then instead of a *crisis*, the malignant infection is carried to the brain, from whence Convulsive, and not seldom soporiferous or sleepy Distempers are excited.

But

But that it is argued, that this Disease seems to be Hysterical, because Remedies applied about the *Abdomen*, often bring help; it will be easie to shew, that the morbid cause plant'd in the mesentery, oftner than in the Womb, is sometimes either taken away by that means, or restrained from its influence: besides, the same kind of applications, about the *hypogastrium*, are no less profitable, altho the original of the Distemper, be derived from the head it self: for we have shewn before, that when the heterogeneous and explosive matter, descending from the head, brings a Convulsive disposition to the spirits disposed within the whole processes of the interior nerves; the Convulsive motions therefore excited, begin from the extremities of the nerves, and so creep upwards towards their beginnings; so that first of all the *Viscera* of the lower Belly, then the *Præcordia*, and lastly the Brain it self are affected; but if the outmost spirits, *viz.* those dwelling in the enfoldings of the mesentery, be restrained from entering into explosions, all the rest, in the remaining nervous passage, continue in their orders: and this, Plaisters worn upon the Navel, do often effect: for they repress, and compel into order with their odour, the spirits from leaping forth; yea also, not seldom, they shake off and drive away, the *Copula* cleaving to them: wherefore, when the explosions there about to be made, are restrained, the Convulsive fit is wholly prevented: which yet is more apparent, for that, if the Convulsion began in the lower belly, and from thence ascending like a Globe; be presently suppressed, and by a strong binding together of those parts, it be hindred that it creep not upwards, oftentimes the Convulsive Passion is broken off, the *Præcordia* and the Brain being untouch'd: wherefore it is a common custom for sick Women, to bind strictly the *Epigastrium*, with swathes or rollers, and so to stop the progress of the symptoms towards the upper parts: For when the animal spirits enter into Convulsions successively, as it were a fiery enkindling, wherever the tinder or cherishing matter is cut off, or intercepted, the Distemper is there restrained.

As to the various effects of odors, to wit, that sweet things bring on the fit, but stinking things drive the same away, it may be said, that the former do loosen the animal spirits, by pleasing them, and too much release them from their wonted tasks of influence, and so provoke them ready to be exploded, in such disorders, yea and as a flame put to them, do somewhat inkindle them: but on the contrary, stinking things repress the spirits, drive them back from excursions and exorbitances, and compel them into order, yea like Sulphur, mixt with *aurum fulminans*, take away from them their explosive force.

What we have hitherto said, of the Passions called from the Womb Hysterical, will yet more clearly appear, if for the confirmation of our *Hypothesis*, we shall add arguments taken from Anatomical observations; I will therefore lay before you a notable case, by which the former reason, and causes of the Convulsive Distempers, may be very much illustrated.

A very Noble Lady, of a most curious shape, and highly indited with a virtuous disposition of mind and manners, of late lived near to this place, who being for many years obnoxious to Convulsive Distempers, for that she had originally, or hereditarily contracted this sickly disposition, and had experienc'd the fruits of this morbid seed, almost every lustre of her age, but chiefly as often as she was with Child, (for she very frequently miscarried) was wont to be tormented above measure, with convulsive passions, as it were hysterical; because, presently after the restraint of her monthly flows, the heterogeneous Particles being translated to the brain and nervous stock, caused fits of this most cruel Distemper, Observation.

After she had newly conceived, in the first months, according to her old custom, she was presently molested with Convulsive Distempers; about the ninth week of her big belly, from taking cold, she fell into a dangerous Fever, in which very acute pains tormenting her in her loins and bottom of her belly, for many days, seem'd to threaten an abortion: but these pains, as the event shew'd, rather to be termed Colical, proceeded from a sharp humor falling down into those parts, from the brain, by the pipes of the nerves: for towards the declining of the Fever, this matter being somewhere else translated, a great looseness or Diarrhæa, pains of the feet, and as it were an Ulcerous disposition succeeded.

As soon as this Lady became well from her Fever, and those pains, the Convulsive Distemper returned; for every morning, wakening from sleep, she was wont to suffer Convulsions, and cruel contractions, about the parts of her face and mouth, as also in her arms and thighs; which symptoms, without doubt, did arise from a serous heap or gathering, laid up in the head, about the beginnings of the nerves; and by them imbibed, together with the nervous juice, more deeply in sleep; and when afterwards the same matter was carried by the pipe of the interior nerves, into the foldings of the

Mesentery and Loins, most cruel pains of those parts, and also fits as it were Hysterical, did most grievously infect her.

But these Convulsive motions of her face and members, after a little time ceased; but yet she still remained weak, and without strength, with a pale countenance, an infirm and trembling gate, and desirous only of congruous food, and hot Liquors: about the end of the third month, at which time she was wont continually to miscarry, her *menstrua* broke forth, which coming away for two or three days together, with little pieces of broken membranes, she expected to miscarry: But that flux ceasing, pains as it were of one in labour, in her *abdomen* and loins, as before arose, and for the space of a week, tormented her day and night; at length, having used a bath of *Emollient* herbs, and afterwards put to bed to sweat, she brought forth the burthen of her womb: the conception so coming away with mighty pain, was about the bigness, and like the figure of a Turkie egg: the exterior coat of it was torn and broken, the interior remaining whole, contained about half a pint of clear water, and nothing else besides; there appeared no shape of a Child, or any rudiments that it would ever be one: Afterwards for 4 or 5 days, her flowers flowed forth, with some pieces of broken membranes: in the mean time, pains with their wonted fierceness tormented her; and when the space of a week being elapsed, they left not off of themselves, remedies at length were sought to allay them.

To this end, first Liniments, Fomentations, Baths; and Clusters, were often administered: also Medicines purging the filth of the womb, on which the cause of all the evil was cast, were taken inwardly: Short intermissions of her tortures followed upon the use of the former; but then the Distemper returned, with great trouble; yea the Disease much increasing, in three weeks time, got many other horrid symptoms: for besides the pains in her belly and loins, which became more cruel every day, also she was shortly after tormented in her back, neck, shoulders, as also in her arms and thighs, with most cruel pain; and that more bitterly, as soon as she was warm in her bed; besides, she was afflicted with a frequent giddiness, vomiting, and nausea, and often in a day, with most grievous Convulsive fits, *viz.* First a bulk was seen to ascend in the bottom of her belly, and presently it lifted up her whole belly forceably, by and by respiration being restrained, an insensibility, with a dead countenance succeeded: after that she had thus lain as one dead, for three or four minutes of an hour, she was wont suddenly to leap up, that she could hardly be held down, or kept by those standing by; then followed cruel contractions, and distortions in all the parts of the mouth, and face, as also in all the members of the body: These symptoms were indeed judg'd to be Hysterical, because this Noble Lady so lately had miscarried.

But weighing every one of these; I was at last of this opinion, that the cause of either fit, *viz.* Both the *dolorifick*, and the Convulsive, did depend wholly on the evil affection of the brain and nervous stock, and that without any fault of the womb; for that a sharp humor being heaped up within the head, did from thence descend thorow the passages of the Nerves, into parts at a great distance; which lodging upon the membranes and *Fibres*, and fermenting with the humor, flowing in from the bloody mass, did irritate them very much, and so stir'd up most cruel pains: Then afterwards, when the heterogeneous and explosive particles, being admitted with what humor within the head, and entring into the nervous passages, did cleave to the spirits: therefore the Convulsive disposition, then breaking forth into grievous fits, was induced, as shall be by and by more largely laid open.

Instituting Curatory intentions, according to his kind of *Ætiology*, I order'd to have blood taken from this sick Lady, at what time she most grievously laboured, out of the *Saphena vein*, and within two days, to be given her a gentle Cathartick, and that to be reiterated, once or twice in a week: Also on other days, Morning and Evening, I gave her spirits of *Harts-horn*, and at other hours, twice or thrice in a day, of the Powder of Pearls, and Crabs-eyes, with a Dose of the following Julup: Take of the water of Snails, and of Worms magisterial each three Ounces, of *Saxifrage*, and black-Cherries each four Ounces, of Hysterical water two Ounces, of the Syrop of Corrals an Ounce and a half, of the tincture of Costor one Dram, mingle them: The bath of sweet herbs was frequently used; when necessity urged, she took Opiats always with good success: Vesicatories were applied to the inward part of either thigh, also to the hinder part of her neck; also Fomentations, Oynments, Clusters, Cupping-glasses, Sneezing-Powders, with many other manner of administrations were prescribed, according to the exigences of the symptoms.

By this method observed for about 14 days, the Noble Lady having received very much ease, was wholly rid of her Convulsive fits. Yea, the torments of her bowels and members, and the other symptoms being very much lessen'd, she hoped quickly to recover

recover her health : But after this, partly by reason of an ill order of Diet, which the sick Lady always indulg'd her self in, or taking little, but chiefly, by reason of a sudden passion of fear and sadness, which an unlucky accident hapning within her own House, had caused, she fell into a relaps, by and by the Disease growing into a much worse condition, for both the Convulsions and Pains did infest her more bitterly ; yea, and her Stomach being almost tired out with continual Vomiting, would not admit either of Food or Medicines. She took Asses milk for some days, with some success ; which notwithstanding, so far as breeding Choller in her stomach, she found it troublesome, she shortly omitted : at length in spite of all Remedies, prescribed carefully by the consultation of many Physicians, my noble Patient from day to day grew worse, and by degrees death approached : Two days before her death the torments of her belly and loins very much abated, and she became more than usually chearful, and conceived some hope of Recovery ; But in the mean time she complained of a pain and great heaviness in her head ; and about the beginning of the night she slept soundly, but being awakened she fell into a very horrid convulsive fit, which presently pass'd into a quick deadly *Apoplexie*, for being made insensible and speechless, she left this life within twelve hours.

When various judgments had pass'd about the cause of the sickness, of which this illustrious Lady died, most flinging all the evils on the Distemper of the Womb ; others on an Ulcer or Imposthum, which they suspected lay hid somewhere about the *Viscera* of the *Abdomen* : it pleas'd her Friends, that her dead Carcase, kept long opened for the Funeral, should be diligently inspected, and so the genuine causes of the Disease, and her Death, might be investigated : which task being left to my care, I executed with all the diligence I was able.

The rational account of the Disease taken from Anatomical Observations.

Therefore in the first place, it was worth Observation, about the habit of the body, that the members and lower parts, nigh and beyond the seats of the pains, were very much wasted : as her thighs, quite worn away, appeared like a Skelliton : In the mean time her face, neck, and arms, remained full and plump enough : from whence it appears, that the nervous Liquor does help no less to the business of nourishment, than to the exercise of the animal faculty : wherefore, when that Liquor, being much hinder'd in its passage, the loins and belly taken up with the continual Convulsions, did not descend, with a due influx, to the inferior parts, they for that reason became presently both without strength, and lean, and wasted. This kind of Atrophie differs in this from other Hectical wasting, which happens from the vice of the blood, because in this latter, an hippocratick or wanish face, is the chief sign of the Disease : in that first mention'd, the countenance, and aspect, show little or nothing of evil.

The dead body of this Noble Lady, tho very lean, and that her bowels were all emptied, yet quickly putrified, for within 40 hours all the skin was discolour'd, and appeared in this part livid, in that green, and in others blackish : and her Corps so suddenly putrifying, yielded a most horrid smell ; the reason of which without doubt was, that by reason the muscles were exercised with perpetual Convulsions, the principles of their mixture were so much loosned, that they being in a readiness for dissolution, quickly after death, fell asunder one from another, after the like manner, as we may observe of the flesh of wild Beasts, which being tired with a long course, or beaten to death with Clubs, for this much sooner putrifies, than the flesh of those which are kill'd quickly, and peaceably.

Her belly being opened, the Intestines and Ventricle appeared whole enough, *viz.* Intire and well-colour'd, but they were empty, and as it were blown up, so far as they were troubled, almost with perpetual evacuations, *viz.* Those placed above or below : in all this cavity, no foot-steps of an Ulcer or Imposthum were perceived. Whilst we were searching the cause of the Disease, and rolling the inwards here and there, there was something met within the mesentery worthy notice, to wit, about its middle, where it is fixed to the back, and contained the greater folds of the Nerves, a substance somewhat loose, and inflated, as it were with many little bladders, equalling an hands breadth, was seen after that manner ; as when in a shoulder of Veal the inter-space of the Muscles are blown up by the Butchers, that those parts might swell up, and seem fuller and fatter : In this place of the Mesentery, because it was more tumid and softer, we thought some humor the cause of the pain to lodg there ; but opening it, I found only the Membranes to have been loosned one from another ; and to conclude, nothing but wind within its inter-spaces : which separation of the Membranes, and devulsion one from another, was without doubt induced by the frequent Convulsions or Explosions of the spirits, which within the enfoldings and nervous fibres, there thickly planted, were almost continually provoked ; and those Convulsions hap-
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ned by reason of the Heterogeneous and Explosive Particles being derived thither from the head, by the pipe of the Nerves.

But as to those torments of the belly, and as it were an ascent of a bulk or substance in the Convulsive Distempers, and the inflation of the *Abdomen*, it is not to be doubted, but that the seat of the morbidic cause did lie hid in that part of the *Mesentery*: but because so much suspicion was had of the Womb, being chiefly affected, we did next inquire how much this inward deserv'd it: Therefore having diligently searched the tunnel, placed within the *Os pubis*, I found the womb in its due place, and as to all parts sound, and well-furnished: its body was drawn to its just proportion, altho it was but five weeks since she had miscarried, *viz.* It was like a small pear in figure and magnitude; the *Glandulas* on either side of the bottom of it, which are called the Testicles, appeared very small and flaggy, without any superfluous or virulent humor contained in them: the body of the womb, wherever it was dissected, equal'd a Thumbs breadth in thickness, its inward cavity was no bigger than what would hold a Bean: within this hollowness, as use to be in the Caverns of other inwards, was included a mucous or dreggy matter, in a very small quantity: but in truth, about the Womb, or its *Appendix*, there was nothing, to which might be imputed as a morbidic cause of the symptoms but now described: From whence therefore it may be demonstratively concluded, as I at first thought, that the Passions termed from the Womb Hysterical, are most often excited from some other cause than the fault of the womb.

The Intestines being removed, we found also the reins sound enough, but one of them was of an unusual figure, *viz.* It was cleft into many Lobes, like the Kidney of a Calf.

The *Milt*, *Pancreas*, and *Caul* without fault: the *Ventricle* was much blown up, and its inward Coat was plain without folds, or wrinkles, which certainly hapned, by reason of its frequent Vomiting, this inward being almost continually troubled with Convulsions: Besides, for this reason, the tone of the stomach being broken, it did neither rightly desire, or concoct the food, or aliment.

The *Liver* very much differ'd from a sound constitution, for it was tumid and somewhat hard, of a pale colour, like rotten wood, wholly dry and without blood, and this without doubt, the frequent use of Cordial, and highly hot Liquors had effected.

The *Lungs* were of a blewish colour, and every where obstructed, and stuffed with a stinking and frothy matter: certainly this inward and the Liver had been vitiated of a long time, wherefore as the blood being degenerate, and very much depraved of a long time, from its right temper, had yielded the first seeds of this sickness, so also it afforded a constant cherishment of it.

But indeed, we sought, and that not in vain, for the chief, and as it were original cause of the Disease in the head; therefore the skull being taken off, the Vessels of the *Meninge*, and those creeping about the Brain appeared full, and distended with blood, when in the rest of the Body, scarce any Blood had flow'd forth, in the cutting of it: the thicker *meninge* being removed thorow the other thin and pellucid one, was discerned a clear water, filling the enfoldings and crevices of the Brain, and as it were overflowing its whole substance: In truth, the serous heap of waters, had filled full all the cavities, and inward places of the Brain: the enfoldings of the *choroides*, or net-like membranes of the Brain, being a long while immersed in water, and as it were boiled, were become discolour'd and half rotten: nigh to the beginning of the Splanchnick nerves, or belonging to the Spleen, the water insinuating it self very much, had separated the *pia mater* from the trunk of the oblong marrow or pith, for two fingers breadth: without doubt, the morbidick matter descending from the head, by the passage of these nerves, into the enfolding of the *Mesentery*, was the cause of the pains and Convulsions: Further, the same matter also afflicting the heads of other Nerves, and passing thorow their Pipes, produced afterwards, these most cruel Distempers in other parts, to wit, almost every where of the whole body.

As to the Cure, or means of healing, used in the Passions commonly called Hysterical: forasmuch as the symptoms of this Disease are very much Convulsive, therefore it is fit, that anti-spasmodic or anti-convulsive Remedies, such as were before described, should be chiefly indicated; but when these Distempers most often happen to the Female Sex, in whom for the most part, the menstrual flux, and other accidents of the Womb, do challenge a part in the morbidic cause; therefore Medicines respecting the various dispositions of the Womb, are to be added to the former, and many ways to be compounded with them. The Therapeutic or Curatory Indications, are either Curatory, to be administer'd in the fit; or preservatory, which are instituted out

out of the fit, that take away the cause of the Disease, and prevent its comings or accessions.

1. As to the first, if the fit is wont to be light, and without other perturbation of *Curatory*. the spirits, it may be permitted to pass away of it self; but if it being more heavily troublesome, there will be need to bring some help to nature much oppressed, this only thing is to be done, that the spirits being freed from the Embraces of an Heterogeneous *Copula*, they may remit their inordinations and explosions: For this purpose, it is grown into use, to put to the nose stinking and ill-smelling things, the scents of which compel and repress the too fierce spirits, ready to leap forth into their orders, and also shake off from them the heterogeneous *Copula*, and often drive it quite away: *Asafetida*, *Castor*, *Galbanum*, being put into fine Linen, and applied to the Nostrils, are convenient; also burning of *Partridge feathers*, old skins, and sulphur. Besides the spirits and oil of *sut*, or of *Harts-horn*, do not seldom help: yet I have known these kind of fumigations, being very troublesome to some Women, to increase the fit; it is probable that the same sometimes may too much irritate the spirits, and drive them into greater disorders; and as stinking things put to the Nose, so the like poured into the mouth, do often bring help: wherefore we give often with good success to Hysterical people, *Tinctures of Castor*, *Solutions of Asafetida*, and *Galbanum*, *spirits of Harts-horn*, and *Sut*, with proper waters. Take of the *spirits of Harts-horn*, from 12 to 15, and 20 drops, let them be taken in a little draught of the following Julup: Take of the waters of *Penny-royal*, and *Mugwort*, each three Ounces, of the water of *Briony* compound two Ounces, of *Castor* tied in a knot and hung in the Glass, half a Dram, of the whitest Sugar one Ounce, mix them. Take of the *Tincture of Castor* one Scruple to half a Dram: let it be taken in a little draught of small Beer. Take of *Asafetida*, and *Galbanum* two Drams, let it be dissolved in *spirit of Wine* to the extraction of a red tincture. The Dose one Scruple, in two or three Spoonfuls of *featherfew-water*. *Riverius* very much cries up that of *Solenander*. Take of *Musk*, and of *Dragons-blood*, each one Scruple; take more or less of it in water of the *Lilies of the Valley*, three or four Ounces. *John Anglicus* commends *Parsnip-seeds*, or the seeds of *Penny-royal*, in Wine, or other proper Liquor, as a most certain Remedy. If the fit persisting a long time, should cause want of speech, or motion, the more sharp Clitters, as of *Briony-Roots*, and *Carminatives* boiled in water, are to be administred, and frictions of the thighs and feet are to be order'd; and if they shall yet grow stronger, Cupping-glasses are to be applied to the belly and groin, yea also, let them be often provoked to sneezing: it is convenient to give some in the middle of the fit, a draught of simple cold water, or in which *Champhir* had been dissolved.

2. The preservatory Indication comprehends these three intentions, viz. In the first *Preservatory*. place to take away, or to derive to some other place the impurities of the blood, apt to be poured forth on the brain and nervous stock. Secondly, to fortifie the Brain, and so to strengthen the indwelling spirits, that they may either not at all receive, or may easily shake off the Heterogeneous *Copula*. Thirdly, to amend whatsoever is enormous in the womb, and contributes to the Convulsive disposition.

1. The first intention is performed by purging, and phlebotomy, and other common ways of purifying and purging the blood and humors. If there be opportunity for an emetic, I judg it best always to begin with it, especially in *Cacochymicks*, or bodies full of evil humors, in the longing Disease, and *Pica*, and in such whose great load of viscous phlegm, stuffed within the folds and coats of the Ventricle, hinders the virtues of other Medicines: The next day after the Vomit, unless any thing bids the contrary, let blood be taken, in women of a hotter temper, presently from the Arm, and afterwards if need be, from the Foot, or from the sedal Veins with Leeches; but in bodies troubled with obstructions, and less hot, let blood be taken more sparingly, and more rarely, and only in places scituate below the womb: After these Evacuations (if they are to be ordered) rightly performed, once within six or seven days, a Purge is to be prescribed according to the following forms: Take of *Pill-ferida major*, one Dram and a half, of the *resine of Julup* xii. grains, of *Tartar-Viriolat*, and *Castor*, each one Scruple, of *Ammoniac* dissolved in Hysterical water, what will suffice to make xii Pills, for iii Doses. Or take of the *resine of Julup* gr. xviii. of *Calomelans* one Dram, of *Castor* one Scruple, make a Powder, let it be divided into iii. parts, for iii Doses, let it be given in the pap of a roasted Apple, or in *Conserve of Borage*: so those indued with a more hot temperament, a Dose of extract, or our solutive Syrtrop may conveniently be administred: for the revulsion of the morbid matter from the head, Issues made in the calf of the leg, or thigh, and sometimes vesicatories, legatures, and painful rubbings, are wont to be administred: But not only a purging of the blood, and a revulsion of its recrements from the head, but an alteration of its Liquor, and reducti-
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on of it to its due temperament, have here a place: Wherefore in some hysterical people, steel Medicines help, in others the use of Spaw-water, or whay, in others the baths are wont to be signally profitable.

The second intention, to wit, the rectification of the brain and animal spirits, is performed with Cephalic, and properly anti-convulsive Medicines: which indeed are to be diligently exhibited almost every day, when they do not Purge or Bleed: since there are various Species of such like Remedies, and several manner of administrations, we will here add some of the more choice forms:

Take of the Lees of *Bryony*, *Assafoetida*, *Castor*, each one Dram; of the Salt of *Coral*, *Amber*, *Tin*, each half a Dram; of *Galbanum* dissolved in Hysterical water, what will suffice to make a mass: Dose half a Scruple to a Scruple, Morning and Evening, drinking after it a Dose of proper Liquors.

Or, Take of the Seeds of *Wild parsnips*, of *Nettles*, each two Drams, of *Vitriol of Steel* one Dram, of the extract of *Gentium*, *Featherfew*, each a Dram and a half, with what will suffice of the Syrrup of *Mugwort*, make a mass, let half a Dram be taken after the same manner.

If the form of a Powder pleases better; Take of the Roots of *Virginian Snakeweed*, and *Contrayerva*, each one Dram and a half, of *Coral* prepared, of *Pearls*, of *white-Amber*, each one Dram, mingle them, make a Powder: Dose one Scruple to half a Dram, Morning and Evening, with an appropriate Liquor.

Opiats are composed after this manner: Take of the Conserves of the flowers of the *Lilie Convallis*, of the *male-Paony*, of *Betony*, each two Ounces, of the Seeds of *Paony*, of *red Coral* prepared, each two Drams, of the powder of *Cretic Dittany* one Dram and a half, of the Salt of *Wormwood* two Drams, with what will suffice of the Syrrup of the rinds of *Citrons*, make an Electuary. The Dose Morning and Evening the quantity of a Nutmeg. After the same manner may be given to poor people Conserves of the Tree of Life, or of the leaves of *Rue*, twice in a day.

The Liquors appropriate against the Hysterical affections, and to be drunk after the aforesaid Medicines, are, either distilled waters, which are to be taken by themselves, or with other things, in form of a Julup; or Decoctions, or Tinctures and Infusions.

Take of the water of *Mugwort*, and of *Penny-royal*, each half a pint; of *Hysterical water* four Ounces, of the Tincture of *Castor* half an Ounce, of the Syrrup of *Corals* one Ounce and a half, mix them. The Dose from an Ounce to an Ounce and a half, with any of the Medicines afore described.

Take of the leaves of *Penny-royal*, of *Featherfew*, of either *Southernwood*, of *Calamint*, of *Nep*, and of either *Horehound*, each one handful, of the Roots of *Briony* four Ounces, of the Seeds of *Parsnips* two Ounces, cut and bruised, put them into *White-wine* or *Cider*, six pints, and so distil them according to art.

Take of the Root of the *Male-Paony*, *Angelica*, *Valerian*, each half an Ounce, of the leaves of *Mugwort*, *ground-Pine*, *Calamint*, *Penny royal*, and *Mistletoe of the Oak*, each one handful, of the Seeds of either *wild-Parsnips*, each three Ounces, of *Raisins* one handful; let them be boiled in four pints of *Spring-water*, to the half: add to it of *White-wine*, one lib. i. β , strain it, and keep it in close Vessels: The dose three or four Ounces, twice in a day.

Take of the *wild-Parsnip Seeds* bruised, two Ounces, of *Castor* one Ounce; let them be put into a Glas, with one quart of *white-wine*. The Dose two Ounces twice in a day.

3. As to the third intention, which inhibiting the disorders of the womb, doth promote the cure of the passion called Hysterical; I say, first of all what in times past was believed, concerning the cause and scope of curing the Disease, that the womb did ascend, therefore that it ought to be reduced into its right place, is altogether fictitious, as we have elsewhere shown: The falling down of the womb, or its coming forth, oftentimes happens; but rarely or never produces the Hysterical Distempers: Besides, the dislocation of the womb in child-bearing Women, sometimes happens presently after their bringing forth, to wit, when the body of the womb being made capacious, and newly emptied, doth not sink down or fall within the Tunnel in its right place, but upwards, inclines now to the right side, now to the left; and there being drawn together like a purse, is folded into a great bulk, which kind of bulk remaining long nigh the side of the Groin, is wont to give a suspicion of another Child, or the secondine or after-birth to be left behind, or also of some hard swelling tumor there increasing; but afterwards, when the *menstruum* coming plentifully away, the womb is reduced to its due magnitude, that tumor by degrees vanishes: but while it there remaineth, unless for that reason, the *Lochia* or *Menstrua* were stop'd, it doth not produce the Hysterical Passions. For the reducing of this part the sooner into its due position, Fomentations,

Liniments, and Plaisters are convenient. But most times that symptom passes over of it self, without any further harm. To what other distempers the womb is obnoxious in child-bearing, and by what method to be helped, we have fully shewn in another place. As to the other vices of that part, which happen to some women, not bearing Children, we declare that they chiefly are either a disease of the womb, made by the breaking of the unity, *viz.* which is either some Ulcer, or Tumor; or an inhibition of some wonted excretion, or putting forth, to wit, a suppression either of the menstruous blood, or the whites, or the seminal humor: Moreover, because of the *Menstrua* being retained, the heterogeneous particles being often poured forth into the head, bring the Convulsive passions: in like manner, when the whites are stopped, the excrementitious matter being supped up by the blood, is deliver'd to the brain and nervous stock: yea, when an usual evacuation of the Seed is hindred, the superfluities of the nervous humor flow back upon the brain, and infect its indwelling spirits with an explosive and morbid tincture: There is no need here, to discourse more largely or particularly of those Peculiar distempers of the womb, but to compound medicines, and intricate administrations, proper for womens diseases, with anticonvulsive Remedies.

CHAPTER XI.

Of the Distempers commonly called Hypochondriack, which is shewn to be for the most part Convulsive: briefly also of Chalybeats or Steel Medicines.

IN the foregoing Chapters we have clearly shewn, that the Passions called Hysterical, do not always proceed from the womb, yea, more often from the head being distemper'd: next, we shall inquire concerning the Hypochondriacal Distempers, of what original and nature they are, and upon the fault of what parts they chiefly depend. The vulgar opinion is, That the symptoms wont to accompany this Disease are wholly produced from the Spleen; wherefore, they are ascribed very much to vapours arising from this inward, and variously running up and down here and there; when in truth, these sicknesses for the most part are convulsions and contractions of the nervous parts: but that it might appear by what causes they are wont to be excited, we ought to consider first the symptoms themselves, and to place them into some order or rank.

As to the Distempers therefore which are vulgarly termed *Hypochondriac*, it is observable, that they happen chiefly to men of a melancholly temperament, with a dark aspect, and more lean habit of body: it is rarely that this Disease troubles fair people with a fresh countenance, or also those indued with a too Phlegmatic complexion: It betrays it self in manifest signs, about the height or midst of their Age; men are found to be more frequently obnoxious to this, than women; being made habitual in either; it is very hardly, or not at all to be cured in women, by reason of their weaker Constitution; it is accompanied with a great many more Convulsive Distempers; wherefore commonly it is said in this Sex, the Hysterical to be joyned with the *Hypochondriacal* Passion.

A description of the hypochondriacal affections.

The symptoms which are imputed to this Disease, are commonly very manifold, and are of a divers nature; neither do they observe in all the like beginning, or the same mutual dependency among themselves: for they seem in these most to affect the Inwards of the lower belly, in those the *Præcordia*, in others the confines of the brain: and in most, though not in all, the ventricle labours much; concerning the appetite it is often too much, but presently burthened with what it hath taken in; and when the food, staying longer in it, by reason of slowness of concoction, their Saline particles being carried forth into a flux, pervert the whole mass of the Chyle into a pulse or pottage, now sour or austere, now salt or sharp: from hence pains in the heart, great breakings forth of blasts, rumbling of wind, and often vomiting succeed; and because of a pneumatick defect, or of spirits, the chyme or juice is not wholly made volatile, and carried forth of doors, but that the ballast of the viscous or slimy matter, sticking to the coats of the ventricle, is left behind; an almost continual spitting infects them;

them; a distention in the *Hypochondrium*, and often there, and under the ventricle, a cruel pulsation is felt: also there pains ordinarily arise, which run about here and there, and for many hours miserably torment with a certain lancing: in the mean time, from the contractures of the Membranes, and from the fluctuation of winds, stirred up by that means, rumbling and murmurs are produced: Also in the *Thorax*, oftentimes there is a great constriction and straitness, that the respiration becomes difficult and troublesome upon any motion: also, most grievous asthmatical fits fall upon some: moreover, the sick are wont to complain of a trembling and palpitation of the heart, with a noted oppression of the same: also a sinking down or melting away of the spirits, and frequent fear of a trance comes upon them, that the sick think Death is always seising them: In this Region, about the membranes, and chiefly the *mediastinum*, or that divides the middle of the belly, an acute pain, which is now circumscrib'd to one part, now extended to the shoulders, is a familiar symptom of this Disease. But indeed in the head an iliad of evils doth for the most part disturb Hypochondriacal people, to wit, most cruel pains returning at set times do arise; also the swimming of the head, and frequent *Vertigoes*, long watchings, a Sea, and most troublesome fluctuation of thoughts; an uncertainty of mind, a disturbed fancy, a fear and suspicion of every thing, an imaginary possession of Diseases, from which they are free; also very many other distractions of spirits, yea, sometimes melancholly and madness accompany this sickness: besides these interior Regions of the Body besieged by this Disease, wandering pains, also Convulsions, and numbness, with a sense of pricking, invade almost all the outward parts; nightly sweats, flushings of the blood in the face, and the palms of the hands, eratick Fevers, and many other symptoms of an uncertain original, do every where arise; concerning which, forasmuch as the genuine causes, and the manner of their coming to pass, could not be readily determined, presently all the fault is cast upon the Spleen, and Physicians accuse that, as if it were the chief Author of every irregular Distemper: but by what right or authority, by and by shall be sought into: In the mean time, it is to be observed, that the chief symptoms of this sickness, are Convulsive, and depend immediately upon the irregularities of the animal spirits, and the nervous juice, rather than on the evil disposition of the *Viscera*, serving for concoction. But indeed, from whence the first rise of this most complicated Disease proceeds, and by what means it brings forth the divers manners of Distempers in so many places, will not be so easie to determine.

The hypochondriacal Distempers belong to the nervous kind.

The causes of the Hypochondriac passion is inquired into.

It would be a tedious thing to shew here, what the ancient and modern Physicians thought of the *Hypochondriac* Passion, and of its essence, and causes; we will only take notice, that most of them do ascribe this sickly Disposition to the only fault of the Spleen; In the mean time some contend that the whole confines of this Inward, partaking of part of the fault, the blood flowing every where in the Splenic and Epigastric Vessels (or those belonging to the Spleen and belly) for that it being guilty of an hot and dry intemperature, and so obnoxious to too much fermentation, brings forth the original, or gives a beginning to this manifold evil: But the famous *Highmore* affording relief as well to the Spleen as the Womb, hath cast the chief cause of this Disease wholly on the vicious constitution of the Ventricle; and from thence he would have the reasons of the aforesaid symptoms to be originally sought: But indeed, that he might frame a fit *Hypothesis* for the solving the *Phænomena* of this sickness, he first supposes the tone of the stomach to become too loose and weak, that for that reason it hardly and very imperfectly concocts the aliments: so that the thin and more spirituous part of the Chyle, being sent from thence, sooner than it ought, to the blood, perverts its disposition to a hot and sour temper; then the residue of the food, by a longer stay within the Ventricle, degenerates into a ponderous, and viscous or clammy Phlegm; which also, by its stagnation (even as it is observable in things to be eaten, being longer kept) becomes very sour, or sharp: But from hence that learned Man argues, that from the blood made too serous and thin, its effervescencies quickly passing thorow it, are induced: and from the stomach, loaded with ballast of ropy or viscous matter, the wind and distentions of the Ventricle and *Hypochondria*, as also the belching, and troublesome spitting do arise: whereby indeed, he wholly exempts the Spleen from this fault; he contends, that it doth neither draw to it self the melancholly dregs of the blood, nor serves for any office whatsoever, about the sanguification or the making of blood; but that its use almost only consists in this, that this Inward swelling up, or growing turgid with very hot blood, it administers heat to the adjacent Ventricle, and cherishes it with gentle warmth.

Altho I may so far assent to this famous Author, concerning this opinion, that I yield, the ventricle doth often grievously labour in this Distemper, forasmuch as the tone of which, being made lax, and its strength broken, by reason of the indigestion of the aliment

The Hypothesis of Dr. Highmore sifted.

ment, a load of viscid Phlegm, or Petuitous matter, is begotten even in its bosom, to which, by reason of the Saline Particles being brought into a flux, by their long stay, oftentimes a notable soariness and austereness happen; then because the fault in the first concoction is not mended, the dyscrasies and disorders of the blood receive that want of digestion in the second: But yet he cannot draw me into that opinion, that the ventricle is always chiefly in the fault, or that the other symptoms of the Hypochondriacal Disease, depend only on its vitious constitution: For I have known many cruelly afflicted with this sickness, who have been well enough in their stomach; although they have very much complained of the pulsation in the left Hypochondrium, of the straitness of the breast, and a wandering pain excited in it; also of the trembling and oppression of the heart, with a continual fear, and disturbed Imagination; in the mean time, they were wont to desire food greatly, and to digest whatsoever was eaten, without any trouble of the ventricle, or heaviness, and also without any spitting or acid belching: yea, I have observed others, great drinkers, and using an evil manner of living, to have contracted a looseness of the stomach, with an ill digestion, windiness, and frequent vomiting, who found enough about their *Præcordia* and animal faculties, were not at all accounted for *Hypochondriacks*: Besides, in this Distemper, the ventricle is often rather sick from the vitiousness of other parts, or of the blood, than from its own default; because, it is usual for, those sort of sick people to be well in their stomach, so long as they may lie a bed, and breathe it forth; but when they are raised up, the pores being shut up, and the dregginess of the bloody mass stagnating within, presently to be afflicted with the pain of the heart, an aggestion of wind, and frequent endeavours to vomit.

For these and other considerable Reasons, I judge the original of the *Hypochondriacal Disease*, to be derived from some other Fountain than the weakness of the Ventricle: but forasmuch, as among the parts here primarily suspected to be affected, great complaints are made against the Spleen; it will be worth our while to enquire, what office this Inward doth discharge; then, as often as it fails in it, whether it contributes to this Disease.

Though I may grant with Doctor *Highmore*, that the Spleen doth cherish the Ventricle with its warmth, and so perhaps in some measure help Concoction; yet I do not conclude this part to be framed chiefly for that end, but for some more noble uses; because, there seems to be need for the digesting of the food in the stomach, not so much of heat, as of an active ferment: For Fishes being actually cold, devour their food whole, and without the help of heat, easily concoct the same, being resolved as it were by a certain *menstrum*: besides, it is observed of the Spleen, that though in man its whole substance lyes near to the Ventricle; in most other Creatures, who are indued with a longish form, as to the greatest part of it, it is removed from the Ventricle: Further, if the Spleen be the only Chimney, in which the Blood warming the Ventricle is contained, what is the reason that it, rather than the Liver or Lungs, becomes of a livid or blewish colour, and is stuffed with a black blood, and that less hot?

The use of the Spleen is inquired into.

When I consider these things, which sometime since I have observed concerning the use of the Spleen; it seems far more probable, that a certain dreggy portion, viz. a course of ferment consisting of an earthly and fixed Salt, is laid up in this Inward, by the Blood carried to it; by the Arteries, which being exalted there as it were by digestion, and into the nature of a ferment, is lastly committed to the blood, flowing from it by the Veins, which inspires or quickens it with a certain leaven or fermentation, and performs the same thing about its Spirit, or making it Spirituous, as our ferment commonly called Leaven, doth, being put into a batch of bread or dough; for as a certain portion of the unbak'd bread or dough, being kept to a sourness, preserves the same nature that it doth ferment or leaven other bread or dough, and stirs up in it the otherwise sluggish Particles into motion; so it seems, that the Blood being laid up in the Milt or Spleen, and there getting a sourness, as it were by stagnation, puts on the nature of a ferment, whereby indeed the rest of the mass of blood, and perhaps the other humours, are actuated, and as it were Spiritualised into a more lively motion. What hath been ingeniously wrote by a late Author, viz. the most learned *Velsius*, concerning the use of the Spleen, may have relation to this: for he hath determined as highly probable, a ferment to be contained in this inward, whereby the sluggish Particles of the blood are brought into a state of activity: Because, taking notice that in children, and others indued with a sanguine temperament, and more fat or dull habit of body, even as their manners and disposition of mind were inclined to idleness, softness, and dulness, so their Spleen was ever of a reddish colour, and full of florid blood, like the Liver: from hence he concludes, that the Spleen doth but little perform its office in these, as the genital parts before ripe age, or in those of weak Loyns; but on

See his dissertation. Chap. 5th.

the contrary, forasmuch as men of a middle age, and chiefly in those who are of a severe Countenance, and of a lean Body, as in them appear marks of cunning, sagacity, fortitude, and constancy; so their Spleen is found to be of a livid or blewish colour, and imbued with blood as it were muddy: further he argues from hence, that the blood being kept long in the Spleen, as in a conduit or receptacle, turns plainly into ferment, by which its remaining mass being from thence inspired, is made more subtil, and begets more acute Spirits, both in the vital and in the animal Kingdom or Government: For he supposes our bodies naturally to abound with too much humidity, by which indeed the function of the parts, and many of the *Viscera*, are very much dull'd: but that the Spleen doth communicate to the mass of blood, solid, firm, and constant parts, and not easily to be dissipated; and that those do wipe away that moistness, and with it carry away in some measure that softness from the Blood and Spirits, which is predominate in tender Age, almost after the same manner as the North-wind, or eastern gales, fanning and intimately penetrating the air with the dryness and strength of their parts, breathe health or strength to the Air, and to our Bodies.

But since I have in another place, declared what I have formerly thought concerning the Spleen, there will be no need to repeat it in this: yet I shall further note, that in bodies of living Creatures, compacted out of a quinarie of Elements, as the Spirits ought to be more strong then the rest: so indeed they being intangled with a viscous humidity of Sulphur and Water, are so hindred, that oftentimes they are not able to exercise their strength or powers lively enough; hence saline Particles, for that they are very much fermenting, are required for this, that the spirituous little bodies, almost overwhelmed by the embrace of the others, and stupified, might lie awakened, and set at liberty, and into motion. Wherefore we experience in our selves, when the Spirits are dull'd, by the Blood being too much exhal'd, that notable help is brought by sharp Liquors, as chiefly small Wines, and Cider: for these kind of Remedies sharpen the Spirits, and shake off all heaviness. Such a kind of fermenting virtue we easily believe to be continually exercised by the Spleen being in right order, towards the Blood and nervous Liquor.

For as this inward is formed with a threefold sort of Vessels, *viz.* with Arteries and Veins, and besides with great enfoldings of the Nerves, and a most thick contexture of nervous *Fibres*; we think the use of each of them, to be set apart for this end: *to wit,* by the Arteries the blood is carried to the Spleen, hence it lays up its dregs, composed of a fixed Salt, and an earthly matter, in its passages and porosities, and these there laid up, as it were by a certain digestion, are brought into a juice very fermentive: A portion also of which, being carried back to the Blood, by the Veins, is continually mixed with it: and so its whole mass is inspired with those kind of fermentive Particles from the Spleen; by which a certain austerity and sharpness, with vigour of motion, is given unto it; so that for that reason, the Blood it self is carried more lively in the Vessels; also from thence, the nervous juice procreated from the blood, being more active, supplies the animal regiment; But truly, the Spleen doth not only by this means mediate, and by the intervention of the blood, inspire the Brain and nervous stock with a fermentive virtue; but it may be lawfully believed, that this is done somewhat more immediately by the passage of the Nerves, dispersed in the Spleen: For, because in this part Anatomy discovers a great company of Nerves and nervous enfoldings, and of *Fibres* springing from them; it may well be doubted for what use they should serve: Concerning this, it is first to be observed, that the Ventricle and the Spleen have a most intimate commerce with the Brain; inasmuch, that *Helmont* did place the seat of the Soul in those inwards; but this is possible to be done by no more commodious way, than by the aforesaid Nerves: Wherefore we may here deservedly suspect, That not only the animal Spirits, are the Messengers between the one part and the other; but also, that the nervous Liquor, which is both the Food and the Ventricle of these Spirits, doth descend now from the Brain towards these inwards, and now being received from these *Viscera's* by the Nerves, doth creep thorow towards the Head; which kind of spleeny Juice being dilated to the Brain, sharpens the animal Spirits, and raises them up being slothful, and irritates them into quick motions: from whence it is commonly said, the sharpness and sagacity of the mind doth proceed from the Spleen; and splenetick people are accounted ingenious: But it is probable, that the rage and force of the Passions, being begun by the Spirits inhabiting the Brain, are carried to the Spleen by the passage of the Nerves; and so the Spirits there dwelling are pathetically troubled, and the Blood flowing thither is moved into a multitude of perturbations: For from hence it in some measure falls out, that in anger, sadness, and other distempers of the mind, according as the ferment, if the Spleen being more or less moved, is inspired to the blood, its liquor diversly

diversly boyls up: Further, for this reason it happens, that great Inflammations and Com-motions of the left *Hypochondrium*, come upon splenetick people from every violent passion.

These things being thus premised concerning the use of the Spleen, it will be easie accord-ing to our *Hypothesis*, to lay open very many of the Symptoms belonging to the *hypochon-driack* distemper, and to give reasons for each of them: For when the Spleen is want-ing in its office; that is, when it doth not strain forth the melancholy Recrements of the Blood, nor Cook them into a fermentative matter, as we but now observed in Children, and others of a sanguine Complexion, or too Phlegmatick, to happen often; the disposition of the mind is made duller, the body grows fat with idleness; yea and the blood being more sluggish than it ought to be, is apt to stand still within its Vessels, or at least to be less lively circulated: But on the contrary, where the fermenting power of the Spleen is too much exalted or perverted, the blood by that means being more sharp than usual, or made more sower, it runs about rapidly here and there, and con-ceives irregular motions; yea, and the nervous juice, falling away from its right tem-per, imbues the animal Spirits with an heterogeneous and an explosive *Copula*, and so irritates them, as it were with goads into frequent Convulsions: as that not wholly unde-rservedly, many kinds of Diseases may be imputed to the Spleen being out of order: But the ways or means of affecting, whereby the Spleen being evilly disposed, doth pro-duce the Symptoms of the hypochondriack passion, or at least contributes to the rise of them, are chiefly these following.

The reasons of the hypochon-driack symp-toms laid open.

First, It sometimes happens, that the spongy substance of the Spleen from the fæces of the blood, being too much impacted in its Pores, and stagnating, is very much stuffed and obstructed: That from thence, it doth not sufficiently receive the Recrements of the bloody mass: But the same being carried thither, but not received, do flow back into the neighbouring branches of the *Cæliack* Artery, from whence they are presently carried into the Membranes of the Ventricle, the Caul, the Mesentery, and other nigh parts, and are wont to be affixed to them; hence the tone of those *Viscera* are so much spoiled, that they do not rightly perform their due offices about the Concoction of the Chyle, and the Membranes planted every way about, being much imbued with heterogeneous and irritative Particles, for that they are almost continually pulled by Convulsions here and there stirred up; they are grievously obnoxious to wandering pains, contractions, di-stentions, and the encrease of Winds, by reason of this kind of regurgitation of the blood from the Spleen being obstructed; it is likely, that the pulsation which is felt by hypo-chondriacks under the Ventricle, is excited.

The Influences of the Spleen in producing the symptoms, unfolded.

2. When the fæculencies of the Blood are excluded from the Spleens being obstructed, being fixed (as was said) to its neighbouring parts, they bring forth the sickly distemper of the left *hypochondrium*: But though indeed, that inward sufficiently receives the me-lancholy or atrabilious juice carried to it from the Blood by the Arteries; yet oftentimes it doth not rightly Cook it, but the Salt being too much excited, it changes it into a too sharp, or acid, austere, or sower, or some other kind of vitious humour; whereby when as the whole mass of blood, and the nourishable juice contained in its bosome, are almost wholly infected, the fruits of the hypochondriack Seeds bud forth thorow the whole body; the blood grows unduly hot, is in some places impetuously moved, and again in others is apt to stagnate or stand still: from hence, it is familiar with splenetick people presently after eating to grow red in the Face, to have the Palms of their Hands hot, their Hypochondria to swell; oppressions of the Heart, and noted variations of the Pulse to succeed: But these fermentative Particles being translated from the Blood every where into the solid parts, wandering pains, running up and down here and there, and a sense of pricking are stirred up in many Members of the Body: Moreover, from this infection of the blood, for that its mass is changed from a benign and balsamick temper, into a salt and tartareous, a lean habit of Body, with a black and dark Countenance is in-duced.

3. From the Blood being so depraved by the fault of the Spleen, oftentimes the taint is carried to the animal Government; for heterogeneous and convulsive Particles are poured frequently into the Brain, and from thence into the nervous stock; so that the animal Spirits dwelling in either Province, conceive various irregularities; by reason of the evil being impressed on the Head, hypochondriacks use to be troubled with various Phantasms, with an heap and fluctuations of thoughts: besides to them happen frequent Vertiges, Scotomies, Head-aches, and often paralytical Distempers: Then, forasmuch as the morbidick matter slides down from the Head into the nervous stock, convulsive Diseases are excited in very many parts of the body, but chiefly about the *Præcordia* and *Viscera* of the lower Belly; for when the Spirits flowing within the Nerves which respect those parts, are greatly disturbed by reason of the distemper of the mind, the

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Convulsive Particles the more readily enter into those Pipes, and more easily impress on those Spirits a convulsive Disposition: Therefore partly by reason of the infection mediately transmitted to the Brain, and partly by reason of the hurt (as hath been shown) immediately communicated from the Spleen, the Palpitation of the heart, trembling and frequent swooning, constrictions of the Breast, impediments of Breathing, pains of the Stomach, Belching, Vomiting, and many other accidents in those inwards happen to hypochondriacks.

4. Besides these inordinations which are wont to be derived by the passage of the blood from the Spleen, into the humours and solid parts, and to the brain itself, and nervous stock; there are other farther evils which seem to arise from this inward, also by the passage of the Nerves: Because, as we have shown, their extrem branches, and the nervous *Fibres* themselves, interwoven in the *Viscera*, do drink in with their outwardmost little mouths a certain humour, and convey it sometimes upwards; it is highly probable, that the nervous *Fibres* distributed to the Spleen, (of which as we but now hinted, there is a mighty guard) do receive its most sharp juice, which creeping higher thorow the nervous Pipes, becomes a Cause of convulsive Motions: In truth, that there may be those intimate Commerces between the brain and the Spleen, to wit, far sooner than what can be made, by the compassing about of the blood; it may be lawful to believe, that the nerves of the wandering pair, and the intercostal, to be the nearest means of the passage, whereby these parts Communicate one with the other, and mutually affect themselves. For it seems that when the black bile or melanchollic tumour in the Spleen, grows turgid, or swells up of its own accord, or is moved by some evident cause, its particles enter the nervous *fibers*, thickly distributed to the same, which disturb the animal Spirits flowing in them, into explosions, or at least into some disorder: then the Spirits being so disturbed, infect those next to them, and they others, till by their continued series, the passion begun within the Spleen, is propagated even to the brain, and there produces inordinate Phantasms, such as happen to hypochondriacks; also on the other side, when a grievous distemper of the mind, occasionally excited within the brain, doth disturb the Spirits inhabiting it, the impression being carried to the Phantasie, by the series of the Spirits, planted within the nerves of the wandering pair, and the intercostals, and successive affection, it is brought even to the Spleen; hence its ferment being put more into commotion, stirs up Convulsions, both in that inward, and in the whole neighbourhood of *Fibres* and membranes; and besides, forces the blood into ebbings and flowings, and into various æstuations or vehement motions, yea and reflects the perturbations of the Spirits, upon the brain. From this kind of reciprocal affections of the brain and Spleen, it comes to pass, that hypochondriacks are so unquiet, unstable, and fluctuating, at every thing that's proposed, as if, according to the Poet, Ten minds strove in them at once.

1. Observation.

A certain noble Gentleman, of a melancholick temper, and always accounted for a Splenic man, very much complained of a pain and inflation of his left hypochondrium, with a frequent rumbling noise, and sour belching, also of a trembling of the heart; of an assiduous vertigo, too much waking, and a disturbed phancy: About the 35th year of his age, the disease growing worse, he began hardly to sleep, and yet more rarely to get it at night, and to be molested in the day-time with a world of fluctuating thoughts, to have in suspicion all things and persons, and greatly to be afraid of every object: His *Præcordia* seemed to be very much bound and straitned, and to sink down to the bottom, as if the heart it self were depressed even into the belly; which Symptom troubling him, he became very sad, and dejected in mind: yet afterwards, those distempers of the mind remitting, he felt with it his heart to be a little lifted up, and also his *Præcordia* to be loosned, and stretched forth; besides, he very often sustained Pains and Contractions, variously excited, about the Muscles of the *Viscera* and Members, and running up and down here and there.

As to the nature of the disease, it is plain, that it is this kind of Distemper which is commonly called hypochondriacal: but as to what respects the causes of these to be admired Symptoms, we may suppose the mass of blood being degenerate, and stuffed with melancholick or atrabiliary fæculencies, to administer or continually to suggest its adust recrements to the head; from whence the Liquor watering the Brain and Nerves, being made sharp, and impropportionate to the Spirits, did stir up the containing Bodies, into painful Corrugations, or Wrinklins, and Contractions: Further, when this infection is chiefly derived from the Head, into the Nerves of the wandering pair, and the intercostal, the Brain and the *Præcordia* are very much punished by the malady from thence raised up. But that the Blood is depraved by that means, it seems to be imputed to the vice of the Spleen, forasmuch as this inward, being amiss, it did not rightly strain forth the atrabilarie dregs from the blood, but

rather did more pervert whatsoever recrements it received from it, and the same being exalted into an hurtful ferment, sent it back to the blood, and so very much infected its mass, and imbued it with a plainly acetous and vitriolick evil Disposition.

It is plain to be understood, that those symptoms troubling the Head, *viz.* too much waking, the *Vertigo*, a disturbed Phantasy, with many others, did proceed from the heterogeneous Particles poured forth from the Blood into the Brain: As to that straitness of the Breast, and falling down of the heart with great fear and sadness; it may be thought that the nervous *fibres*, inserting to the heart, and chiefly to the *Pericordium*, being moved into Convulsions and wrinklins, do bind hard those parts, and pull them downwards; wherefore, there is perceived in the whole breast, as it were a certain constriction, and the heart it self seems to be depressed: Further, forasmuch as the *Præcordia* being so straitned and depressed, the blood within the bosom of the heart is stop'd and compell'd, as it were, to stagnate, both the vital and the sensitive Soul is much hindred from its wonted expansion and irradiation, and for that Cause being lessened and shortned in its constitution, those Cruel distempers of fear and sadness arise; but when the Convulsions remitting that constriction of the heart, and its *appendix* is released, the Soul also, as a flame more expanded or enlarged, endeavours by little and little to shake off the Chains of these Passions. For the Cure of these Distempers, he had for a long time tried very many remedies, and medical Administrations, but without much benefit; at last he was somewhat eased by the use of Spaw-waters, and from thence by degrees finding himself better, he became free from those grievous Symptoms; however, he still liv'd obnoxious to the *hypochondriack* Distemper.

A certain young Academic, originally of a Sanguine temper, fair, of a flourishing Countenance, excellent Disposition, and Mild, by reason of immoderate and untimely Studies, in the mean time exercise and good order of dyet being wholly neglected, had contracted an obstruction of the Spleen, or some other morbid distemper of that Inward: For he had almost continually infesting him an inflation, and tumor of the left *hypochondrium*, with a most heavy Pain. After he had laboured with this sort of Distemper about half a year, he began to complain of a frequent giddiness, a blindness of his eyes, an inquietness of his mind, and of disturbed sleeps: Which Symptoms were then plainly imputed to vapours arising from the Spleen: but after that followed a trembling of the heart, with a frequent *deliquium* of the Spirits, a pulsation of the *hypochondrium*, and at length Pains and Contractions in the outward members, with a frequent stupor, and a sense of pricking, running up and down here and there: and last of all, being broken with a world of evils, contrary to his *genius* and native Disposition, he became greatly hypochondriacal.

2. Observation.

That I may dispatch the Pathologie of this Case in a word, it appears here plain enough, that the Spleen was first of all in fault; by whose fault, when the bloody mass was depraved, the taint creeping from thence into the humour watering the brain and nervous stock, and infecting it, did induce the aforesaid Convulsive Symptoms.

The Curatory Method to be used against the hypochondriacal Distempers, requires chiefly these four general Indications, *viz.* In the first place, that the Impediments of the Cure may be taken away, the Intention of which chiefly respects the purging and preserving the first passages. Secondly, it must be endeavour'd that the obstructions of the Spleen may be corrected. Thirdly, that both the recrements of the bloody mass may be purged forth, and that its due disposition may be restored. Fourthly, and lastly, that the enormities of the brain and nervous stock, and also of the watering humour, and the inhabiting Spirits, contracted by the fault of the Blood and Spleen, may be amended, or taken away: when any of these Intentions, or all of them together, shall be endeavoured at, fit times should be chosen, in which each being singly proposed, may be performed without any neglect or hindrance of the rest.

The Method of
Curing the
Hypochondriac
Distempers.

1. As to the first Indication, when a great load of crude or adust matter is wont to be laid up in the first passages, and when the tone of the Ventricle us'd to be spoiled, and its ferment variously perverted against every one of these kinds of evils, you must bring timely help with fit remedies; therefore, gentle and moderate evacuations, both by Vomit, if it prospers well, and by Stool, ought to be administered: For such whose stomach easily casts forth its contents upwards, I perswade, that once in a month Vomiting should be several times provoked by taking *Liquor of Squills*, or *Salt of Vitriol*, or by drinking plentifully small beer posset-drink, or warm water; in the time between, a gentle purge, and only a little moving is to be ordered often: For this end, The Pills *Tartareous* of *Bonius*, or Stomach-pills with Gums, or our solutive ex-

tract,

tract may be of use. Take of the best *Senna* one Ounce; of *Rhubarb* 3vi, of *Epithim* 3iii, of *yellow-Sanders* 3ii, of the *Salt of wormwood* 3ii, of *Celtic Spike* 3i, being cut and bruised, let them be digested in x ounces of *White wine*, and as much of fumitory water, for 48 hours, let the clear straining be evaporated with the heat of a gentle bath, to the consistency of an extract, adding towards the end, of the powders of *Senna*, of *Rhubarb*, and *cream of Tartar* each 3ii, let them be bruised together in a glass mortar, and reduced to the consistency of Pills. The Dose 3ss, 3ii, or 3i, the Remedies respecting the tone, and ferment of the ventricle, as they are manifold and divers, out of them the most fit or commodious for the Disposition of the Ventricle, are to be chosen; for to this bitter things, to that Salty, to another sharp and perhaps biting things, are desirable. Among the number of these kinds of Medicines, (which are commonly called Digestives) are *Elixir Proprietatis*, *Tinctura Sacra*, *powder of Aron Compound*, *Salt of Wormwood*, *Cream of Tartar*, *Tartar vitriolat*, *Vitriol of Steel*, with many others. Besides these inward Remedies, also external applications do often bring help: Because the Stomach being ill affected, a fomentation of *white-wine*, with *wormwood*, *century*, and other bitter plants boyled therein, also oyntments or plaisters, often bring help: Concerning which, there will be no need here to discourse particularly, and to prescribe forms of the Medicines themselves.

2. The second Indication, for the mending the vices of the Spleen, (to wit, if there shall be in the same any obstruction, Tumor or Pain, or simple Dyscrasie or Intemperament) is wont to be performed, or at least attempted by Remedies both internal and external: Those which are of the former sort, fall in with those indicated in the 3d place, (to wit, with such, as for the purifying the Blood is intended) because, when chiefly, or almost all that which is carried or born to the Spleen, is done by the passage of the blood, the irregularities of the *Latex* of this, as well as of that inward, by a Social labour, ought to be cured with the joynt strength of Medicines; by what means is shown by and by. In the mean time some external Applications, under the form of a plaister, or an oyntment, or a fomentation, more nearly and immediately respect the body of the Spleen, and often bring notable help, forasmuch as they discuss tumors, and allay the Convulsive Distempers, and quiet them. Great plenty of these kind of outward Medicines, are every where extant among Authors, the choice of which ought to be made, according to the various passions of the Spleen, or the divers Constitutions of the Patient, so that there will be no need here to shew their particular forms.

3. The Remedies indicated in the 3d place, to wit, which take away the dyscrasies or evil temper of the blood, contracted from the vice of the Spleen, and also clear the primary fault of the Spleen, are of a manifold and divers kind and manner, the choice of which ought to be administred, according to the various infection of this or that: of these, some are compounded and prepared according to the prescription of Physicians, as *Electuaries*, *Powders*, *Apozems*, *Tinctures*, *Infusions*, and the like; others more simple, as *wey*, *asses milk*, *Spaw-waters*, and *Baths*.

There are two chief Cases of sick people, in which magisterial Remedies ought to be all accommodated, according to their strength and qualities: to wit, either the blood is thick, coldish, and earthy, with the Spleen being obstructed, which requires more hot fermenting, and chiefly Chalybate Medicines; or the blood being clearly adust, and hot, ferments too much, and together greatly troubles the *hypochondria*, and in them the blood and humours boyl up; in which state, Remedies only temperate, and allaying the fermenting, and immoderate boyling of the humours, are to be chosen, where Chalybiates are wholly to be avoided.

When therefore to a cold ventricle, cold dyscrasies or evil temperaments of the Blood and Spleen also happen, I am wont to prescribe according to the following forms.

Take of the *Troches of Rubarb*, of the *Powder of the root of Aron*, of *winteran Bark*, each 3ii, of the *root of virginian Snakeweed*, *Centrayerva*, *Diatrion Santulon*, of *Crabs eyes*, each 3i, of the *extract of Gentian*, of *Century*, each 3ss, of *ammonia*, dissolved in the water of *Earth-worms*, what will suffice to make a mass of Pills: let them take 4 pills in the morning, and at 4 a clock in the afternoon, drinking after them a little draught of *wormwood-wine*, or *chalybate wine*, with moderate exercise.

Take of the *Conserves of the yellow of Oranges*, and of *Lemons*, each three Ounces, of preserved *mirabolans*, n. ii, of the *Species of aromaticum Rosatum*, of *winteran Bark*, each 3ii, of the *Salt of wormwood* 3ii, of the *vitriol of Steel* 3i, (or *Steel prepared* 3iii.) with what will suffice of the *Syrrop of Citron rinds*, make an *Electuary*, to be taken twice a day, drinking after it a draught of *wormwood-wine*, or of the infusion of the herb or flowers of *Tamarisk*.

For those who are not pleas'd, but with medicines in an elegant form, and in a very little quantity, the tinctures of *Antimony*, and of *Corrall*, also of *Steel*, with the *Spirit of wine*, (the body being first dissolved by a proper *menstrum*, and reduced to a *Calx*) are convenient: as also the *Spirits of Sut*, of *blood*, or of *harts-horn*, to be taken twice a day, with a proper liquor to 12. drops, more or less, are of known benefit, above any other medicine that I know of: moreover the often drinking of *Coffee*, also that made of the Infusion of the leaves of *Thea* gives ease to some.

If that the fervor of the blood, and too fermenting, with the trouble of the Spleen, and inquietness of the mind, be joyned to the hypochondriac Distemper:

Take of the *Conserves of hyss* or *Conaradine*, six Ounces (or of the flowers of *Tamarisk*, and the leaves of *wood-Sorrel*, each three Ounces) of the *Species of Diarrhodon Abbatis*, of the confection of *Alkermis*, each 3i. of the powder of *Ivory* 3iß, of *Pearls* 3ß. of the *Salt of Tamarisk*, and *Wormwood*, each 3i. with what will suffice of the *Syrrop of green Citrons*, or *Clowe-Gilliflowers*, make an Opiate, to be taken twice in a day, the quantity of a Nutmeg.

Take of the *Powder of Ivory*, 3ii. of the *Powder of Pearls*, 3i. of the *Species of Diarrhodon Abbatis*, of *Diamagarit frigida*, each 3iß. make a fine powder, add of *white Sugar*, dissolved in *Baume-water*, and boyled to the consistency of *Tablets*, Six Ounces; make thereof, according to Art, *Lozenges*, or little cakes: take 3iß or 3ii twice a day. To these, and other medicines of this nature, may be joyned the use of *Spaw-waters*, which indeed in either, yea, in all cases of hypochondriac Melancholly, are almost always taken with good success: For want of those waters, our artificial *Spaw-waters* may be conveniently ordered, yea, and whey; and if any notable atrophie be, let *Asses milk* be daily taken.

Besides, these inward Remedies, and other outward Applications before-recited; *Plebotomie*, or the taking away of blood with *Leeches* from the sedal veins, may be of use frequently: yea, sometimes it may be convenient to open the *Salvatella Vein*, according to the prescript of the Ancients: Besides *Cauteries*, or *Issues*, which may continually carry forth the adust recrements of the blood, and by degrees excern them, are wont to be beneficial almost to all.

4. The fourth Indication, respecting the affections of the brain, and nervous stock, or the Convulsive Symptoms, having relation to, or coming upon the former, is rarely in use of it self, and apart from the others, but that Remedies destinated to this end, are complicated with those above said. Liquors indued with a volatile Salt, or an armoniac, as *Spirits of Harts-horn*, and *Sut*, are highly necessary for this intention, as also the rest but now recited; wherefore such Remedies, unless any thing shall shew the contrary, may be daily given at fit hours. Further, when *Spaw-waters* are drunk, let tablets or pills, such as are above prescribed for the Convulsive distempers, be taken, at least twice in a day. In the frequent turning and giddiness, also in the passions of the heart, the sinking down of the Spirits, with dread, and as it were a fear of Death just seizing on one; I have known very often great help to be had by the use of *Chalibeat*, or *steel Medicines*.

Since we have made mention so often of *Chalibeat*, or *steel medicines*, it will be worth our while to enquire into their various preparations, and for that Reason their divers manners of effects, which they are wont to produce in the humane body, that it may from hence appear by what means, and for what respects these or those preparations of Iron are greatly profitable to some hypochondriacks, and to others as much hurtful.

The preparations and effects of Steel Medicines unfolded.

The virtue and operation of *Chalybeat*, or *steel'd medicines*, depends upon the particles of the concerts, being after a various manner dissolved, unfolded, and brought forth into act: For *Steel*, or *Iron*, consists chiefly of a *Salt*, *Sulphur*, and *Earth*; and but slenderly indued with *Spirits* and *Water*: But the particles of the former Elements, chiefly the sulphureous and saline, being in their mixture combined together, with the *Earth*, remain altogether fixed and sluggish; but being soluted, and pulled one from another, they come to be of a very efficacious Energy.

The aforesaid particles are dissolved in a twofold manner, and set into the Liberty of acting; viz. either by Art, whilst Medicines are prepared, or by Nature, after they are taken inwardly; for the metallic Body is wont to be dissolved and eaten by the ferment of the ventricle, just like a Chymical *menstrum*: We will consider the several *Species* of either, and their manner of being made, that it may appear what alteration is impressed on the *steeld Medicine* in the preparation, and what effects every preparation of it doth impress on man's Body.

The most simple way of preparing Iron, is a division of its body into little integral parts with a file, which resemble the nature of the whole mixture, and contain both

little sulphureous bodies and saline, combined among themselves, and with other terrestrial. The filings of Iron being inwardly taken, is dissolved by the ferment of the ventricle, as it were by an acid *menstrum*; the signs of which are both a sulphureous and unfavoury belching, as from the eating of hard Eggs, also the blackness of the ordure, from steel being dissolved within the *Viscera* of Concoction, active particles, both sulphureous and saline, plentifully fall forth, and being involved with the nutritious juice, are carried into the blood; which as they excel in a divers virtue, do often conspire, as it were, with the joynt forces of either, to bring benefit to the sick. The sulphureous little bodies being brought to the blood, add to it a new and more plentiful Provision of Sulphur; wherefore its mass, if before it was poor and liveless, doth nimbly ferment within its vessels, and being inkindled farther in the heart, acquires a more intense heat, yea, and a deeper colour; for it is so observed in many affected with the Dropsie, arising from white Phlegm, the Pica or evil longings, or green-sickness, to have a pale countenance, cold blood and waterish; but by the use of steel, the countenance soon to be more florid, and the blood to be imbued with a more intense tincture and heat: moreover, from the filing of Iron dissolved in the ventricle, also saline particles are brought forth, and often they bestow a more plentiful fruit or increase both on the solid parts, and on the humors; for since their natures are vitriolick, and stiptick or binding, they bind together and, strengthen the too lax and weakned *fibres* of the *Viscera*, and so restore the broken tone: Besides, these saline particles inhibit the force of the blood, repress it from too much heat and boiling up, and froth, and retain it in an equal circulation: Besides (which is their chief virtue) they contract and straiten the too loose, open and gaping little mouths of the Arteries; that, for that Reason, neither the *Serum*, nor the bloody *Latex* may sweat out, or be broke off from the file of its circuit: Wherefore in the Dropsie, and great bleedings, Remedies, imbued with the saline particles of Iron, are of famous and efficacious use; for very many Diseases proceed from this cause; forasmuch as the little mouths of the Arteries being too open, and the interspaces of the vessels above measure loosened, the *serum*, or bloody *latex* breaks forth; which kind of Affections the Vitriolic Particles of Steel do often help, by binding and corroborating the sanguiferous Vessels, and nervous *fibres*.

After this manner the *filings of Steel* being taken inwardly, seems at once to add to the blood both spurs and a bridle. But forasmuch as from this Medicine an incitation, much more than a restriction, doth arise, therefore it ought to be given only to them whose blood is very thick and cold, as countrey people and strong persons; in very hot and spirituous blood, and in hot inwards 'tis no ways convenient: moreover in delicate persons, and men of a more tender constitution, 'tis dangerous, lest the little portions of the steel, when they cannot be sufficiently dissolved, should like fragments of glass, be driven into the membranes of the *Viscera*, and there pertinaciously sticking, produce some Ulcer, or deadly torments, which indeed I have known sometimes to happen.

2. After the filing of Iron, the next way of preparing it, is calcining it with Sulphur, to wit, let thin pieces of steel, being strongly fired, be laid upon a Roler of Sulphur, that the metal may melt into little round balls, which are to be calcined to the consumption of the Sulphur, and pounded in a mortar, are to be reduced into a subtle powder, which is of choice use. In this preparation of Iron, some sulphureous particles are exhaled, the sign of which is, That this powder, an acid liquor being pouged upon it, much less boyls up, or grows hot, than the limature or filing of Iron: but being taken by the same mouth, it excites a sulphureous savour. In the mean time in this preparation the saline particles seem to be somewhat augmented by new ones sticking to them, from the metal burning with sulphur; so that active particles of either kind, to wit, sulphureous and saline, come almost to an *Equilibrium*: and when by this means this medicine, the substance of the metal being loosned, may be finely powdered, it becomes of far more excellent use than the filings of Iron. In most Cases where steel ought to be given in substance, as in a Cachexie, or a fulness of evil humors, the longings of maids, or the green-sickness, and such like, this medicine is convenient to be used.

3. In the third place follows the preparation of steel with vinegar; to wit, the filings of the whole steel is moisten'd with vinegar, and dried, till it may be reduced into an impalpable powder: In this preparation the sulphureous particles are yet much more; yea, as to the greatest part evaporated, only a few being left in the mean time, the saline, by reason of others sticking to them from the vinegar, are much encreased, which are mingled with the terrene particles: This chaliolated powder very little or nothing froths or boyls up, a sharp liquor being sprinkled upon it, also being taken at the mouth, has with it scarce any sulphureous savour: wherefore it conduces less to the taking away of the obstructions of the Bowels, or to the restoring the ferment of the

the blood : nevertheless in a more hot Constitution, in hemorrhages, or fluxes of blood, and the hypochondriac distemper, it is wont to be administered with greater success than the former preparations.

4. Follows the Rust of Iron, which being an extract of the metallic body, seems to be, as it were, a fifth Essence ; because in this excrescency some particles of every kind, to wit, sulphureous, saline, and terrene, being loosned from the whole substance, are combined among themselves, and constitute, as it were, a new mixture, more subtle and desiccated, or clearer from dregs : For that in this concrete there remains less particles of sulphur ; therefore it doth not so potently ferment the blood, or take away the obstructions of the *Viscera*, as steel prepared with sulphur, but in more hot distempers of the parts or humours, it egregiously performs the requisite intentions of a steeled Medicine.

To this Class may be referred by right, our preparation of steel, to wit, in which all the particles of the metal being loosned from the bond of mixture, are contained together ; which notwithstanding (the concrete being first reduced into powder) and immediately dissolved in any Water or Menstruum : This powder being inwardly taken, hath the like virtue as steel prepared with sulphur ; but to the liquor or menstruum in which it is dissolved, it imparts almost only saline, or chiefly vitriolick particles, the sulphureous flying away, and the terrene sinking to the bottom. I am wont to give in great quantity, and not seldom with excellent success, common water impregnated with the dissolution of this, instead of the natural acidulous or spawish waters : moreover I make thereof medicated wine, beer, cyder, whey, or other Liquors, this powder being dissolved in them ; and prescribe them to be taken for several intricate intentions. So much for the preparations of iron, in which the elementary particles of every kind are comprehended in a various proportion : There remain others in which the particles almost only of one kind, to wit, the saline or earthy are left ; the rest, as to the greatest part, being driven forth ; of which sort are chiefly vitriol, or the Salt of steel.

5. For the making the vitriol of steel, first, the metal is wont to be eaten thorow with a very sharp and corrosive Liquor, and to be dissolved into elementary parts : In the dissolving, the saline particles of the menstruum are joyned to the other salines of the Iron, and are with them intimately combined ; in the mean time, the remaining sulphureous and terrene being laid aside, and excluded from their company ; then common water being poured to this solution, the salts of either kind being combined, are imbibed by the Liquor, and that being lastly filtrated and evaporated, they are reduced into cristalls. This kind of making of salt or salification, succeeds, if you do it either with the Spirit of vitriol, the oyl of sulphur, or stygian water, or any others distilled from the stagmas of minerals : Yea, *Sal Armoniac* only, being soluted by melting, dissolves Iron after the same manner, and causes it to chrystalize.

Salt of Steel thus prepared, hath a sweetish taste, with a certain sharp stipticity or binding, and participates much of the Nature of *vitriol*, that it seems not to differ much from *Verdigrease*. Taken inwardly for a medicine, it somewhat ferments the humors, and powerfully binds the nervous *fibres* : for cold Cachetical and Phlegmatic people this medicine is not convenient, because there are in it no particles of *Sulphur* ; but it is often administered with success in hot distempers of the bowels, where there is a predominancy of adust *Sulphur*, and in wandring effervescencies, in scorbutical and unequal heats both of the blood and nervous stock by it self, or mixed with other medicines as an enforcement : but yet in more tender Constitutions 'tis dangerous, lest the tone and *fibres* of the ventricle should be hurt by its acrimony, and too great constriction or astringency.

6. In the last place follows the astringent *Crocus Martis*, or the *Crocus of Steel* prepared by fire through a long Calcination ; viz. The filings, the off-scourings, or thin plates of Iron, should be so placed in a reverberating furnace, that they may be continually heated by a most strong flame : The filing being thus exposed to the naked fire, first of all it grows reddish, and runs together into little hard round balls ; but after Three or Four days, swelling up suddenly into an higher heap, it becomes extream light, impalpable, and of a most curious purple colour : In this preparation the sulphureous and saline particles, whilst by the force of the fire they begin to come away from the concrete, do mutually take hold one of another, and so being combined together, grow into little balls ; but afterwards those particles, both saline and sulphureous, being wholly profligated, and fiery particles succeeding in their place, the whole mass swelling up into a bulk, and made, as it were spongy, becomes most light.

A Medicine thus prepared in some cases is of most excellent use, and second to none of the Chalybeats ; to wit, almost in all extravasations, or too great eruptions of the Serum and blood, as in outward hemorrhages, or in inward bleedings, in the *Diarrhæa*, the

the *Diabatis*, and in a vehement Catarrh; also I have known no Remedy better than this in the *Ascitis*, or in the beginning of a Dropsie: and this also I have heard to be highly approved of lately by a most famous and expert Physitian of our own Country: Concerning which medicine notwithstanding since it is wholly destitute both of saline and sulphureous particles, and consists only of earthly and fiery particles, it is very ambiguous by what faculty it operates, and produces so praise-worthy an effect in man's body: for there seems to be in this left no more *caput mortuum*, or dead head, or *terra damnata*, than in vitriol, or in any of the other metals distilled by a most intense fire. As to this, if I may conjecture, it seems first, that to this preparation some activity is due, whereby it exerts it self, and unfolds its verrues, either by shutting up obstructions, or by binding together the vessels or nervous fibres of the *Viscera*, from the fiery particles shut up in the most fixed earth, and from them breaking forth within the body: But the chiefest Reason of helping, consists in this, That the earthy particles; the saline (by which they were strictly held) being wholly gone, desire greedily to be reunited to them, or such like: Wherefore this *Crocus martis* being immersed in our bodies, snatches to it self whatsoever Salts it meets with, and intimately binds them; and so while it sucks up like a sponge, very many saline particles, it takes away many enormities arising chiefly from the flux of the Salts. By this means *burnt Harts-horn*, *Spodium* and *Antimony Diaphoretic*, when they bring help, exert or put forth their Virtues.

CHAPTER XII.

Of the Convulsive Cough and Asthma.

An example of
a Cough meerly
Convulsive.

THE History before related, doth clearly manifest, That sometimes a Cough may be caused without any great fault of the Lungs, by reason of the sliding down of the morbidick matter upon the pneumonick Nerves, or those belonging to Respiration; to wit, where it was shown in the Case of the Noble Virgin labouring with Convulsive fits, and also with a grievous and continual giddiness, that when by the prescript of the Physitian, a fomentation of Cephalic Decoction was applied to her head, presently the Giddiness ceas'd, and in its place follow'd a great Cough without any spitting, but night and day, almost, perpetually troubling her; which without doubt hapned by reason of the Convulsive matter being driven from the brain into the beginnings of the nerves: This kind of example of a Cough meerly Convulsive, more rarely happens in persons of ripe years, as the like distemper I have not often seen: But in children 'tis usual (also sometimes I have known it in men) for a Cough to arise from a serous Colluvies overflowing the Lungs; which when at first it was simple and moderate, afterwards it became vehement and convulsive; so that in coughing, the *Diaphragma* being drawn upwards, and held in a long *Systole*, or frequently repeated, the Lungs being greatly straitned, were much hindred in their motion. In the mean time, by Reason of the breathing being hindred, and the blood being restrained within the *Præcordia*, and for that cause stagnating in other places, the sick were in danger of being choaked, and often acquired a livid or dead countenance. But in this Case, besides the Convulsions raised up about the *Præcordia*, by the force of coughing, the Ventricle also being oft brought into a consent, cast forth by vomit whatever it contained in its bosom: yea, and I know in some tender ones after this manner affected, the Disease wandring from thence into other parts, did raise up Convulsive motions in the face, eyes and limbs, and at length became deadly. This kind of Convulsive Cough is very frequent among children, and some years lays hold on so many, that it seems to be plainly Epidemical; when it roots it self, it is very difficult to be cured by Remedies; yea, often being long protracted, it is hardly otherwise to be cured, but by the state of the year being changed.

This distemper
frequent enough
in children.

The reason of
it.

If the causes of the aforesaid Case be enquired into, it will be so plain to refer the procatartic or more remote cause to the redundancy of the serous humour in the bloody mass, and in some sort in the whole body; a portion of which matter dropping forth from the little mouths of the Arteries on the Lungs, creates the ordinary Cough; afterwards when the serous Colluvies, or heap of waters yet exuberating in the blood, and stuffed with Convulsive particles, is also heaped up within the head, the same en-
tring

tring the pneumonic nerves, increases the simple into a Convulsive Cough: For when those nerves, being irritated first about their extremities, are exercised above measure; for that Reason they more easily imbibe the convulsive matter laid up nigh their beginnings: and so when at length they are driven into irregular motions in two places, to wit, in the head and at the tale, and that for two distinct causes, *viz.* from the irritation of the Spirits, and from their explosion, it is no wonder if the Cough at first common, being afterward brought into this evil state, becomes so cruel and convulsive: Moreover when it sometimes happens that the same matter heaped up in the head, does enter some other nerve, therefore Convulsive passions of another manner, often come upon the Convulsive Cough.

Having shown after this manner, That a Cough doth arise not only nor always by the fault of the Lungs, but sometimes from a solitary Convulsive cause, but oftener *The Convulsive on Asthma.* superinduced by this on a pneumatic Distemper: also we do not doubt to determine almost the same thing concerning another certain Distemper of the *Thorax*, to wit, the *Asthma*: For whether this Disease be continual or periodical in either case, the Symptom chiefly urging, is difficult breathing; which indeed seems to be excited for this Reason, because the Lungs being too much inflated and distended, extremely fills the Cavity of the *Thorax*; neither do they fall down as they should do by turns: hence the spirit or breath remaining within, is not sent forth freely enough, neither indeed can fresh air be easily induced, by reason the space is before filled: whilst the Lungs *Sometimes it depends of the Lungs, together with the nerves being affected.* are so longer contained in a continual or very little remiss Diastole, oftentimes the *Diaphragma* is urged contrary to its manner, into a violent Systole, and being drawn upwards, is wont more and more to lift up the Lungs, and to hinder their falling down; whereby it comes to pass, that Respiration becomes yet more difficult and more laborious.

We easily believe, that this kind of hard breathing Distemper, doth sometimes happen by the fault of the Lungs, because anatomical Inspection hath plainly detected it: For if a great serous Colluvies being laid up in the *Thorax*, very much stuffs the Lungs, and so much obstructs their pores and passages, that the blood being hindered in its Circuit, cannot freely pass thorow the Pneumonic Vessels; for that Reason indeed such like ahhelous Distempers are sometimes made: Then as often as the blood growing more hot and rarified, by exercise, or the heat of the bed, requires a larger space for its Circulation within the Lungs; then presently from such an occasion a more frequent Respiration, or an asthmatical fit is stirred up: If beside this morbid Disposition of the Breast, the Sanguineous mass also abounding with a serous water, should be apt to sudden fluxions and effervescencies of the Serum, from hence also, by reason of the violent course of the Serum growing hot into the Lungs, being before obstructed and greatly filled; very often most grievous assaults of this Disease, and almost suffocating do happen. Moreover, sometimes beside the Roots of the *Asthma* (as it is said) being fixed about the *Præcordia*, certain shoots of the same Disease budding forth from the head, meet with the former, and being complicated with them, produce the more cruel fruits of the *Dyspnæa*, or want of Breath. For because the Lungs being stuffed with Serum, another quantity of the same, more largely redounding in the blood, being imbued with Convulsive particles, is poured on the head, the same more readily entering the pneumonic Nerves than others, causes the *Asthma* of the *Thorax*, at first simple and moderate, to become periodically vehement and convulsive.

Of these kind of Distempers, *viz.* the *Dyspnæa*, being excited by the singular fault of the Lungs, and with a Companion, very many instances and examples have fallen under our Observation, and do almost daily happen. For there is nothing more usual than for those that are sick of an inveterate Cough, or any other evil disposition of the Lungs, at length the Dropsy or Scurvy hapning to become Asthmatick, to wit, when the Blood being made much more impure, lays up also its serous dregs in the head, these more readily, and indeed more easily enter than others, the pneumonic Nerves, as being weaker and often irritated near their extremities, and in them do heap up matter for a Convulsive *Dyspnæa*.

Further, sometimes I have observed most grievous fits of an *Asthma* to have hapned *An Asthma sometimes* without any notable fault of the Lungs; so that truly I did think that this disease was sometimes *meerly convulsive, proceeds from the nerves only being affected.* times meerly Convulsive, and its fits only excited, because the serous Colluvies or watery heap, being stufft with explosive particles entering into the Nerves, performing the Diastole of the Lungs, grows to the Spirits therein flowing, which being afterwards struck off together, and for a long while, by reason of plentitude or irritation, the Lungs are detained, as it were, inflated and stiff, so that they can perform neither the Offices of drawing in, or of breathing out: But the fit being finished, a free and equal Respiration followed, as before the fit began, and no Cough, or signs of a sickly disposition of the

the Lungs did appear. As I have observed this kind of *Dyspnæa* or difficult breathing merely Convulsive, to have hapned in many, I will here shew you one or two histories of it.

A certain strong and fat Gentleman having used for some time a more full and inordinate Diet, without any exercise, began to be ill about the beginning of the Winter: at first he was troubled with a pain and heaviness of his head, with a great giddiness and fear of swooning, and believing himself just about to die, being otherways healthful; within a few days these Symptoms pass'd into an apparent *Stupor*, or rather *Lethargy*: he being let blood in his Arm, I caused carefully to be applied Cupping glasses, Vesicatories and sharp Clysters, with many other Remedies: In the space of 42. hours coming to himself, he was sensible, and shook off all torpor or drowsiness. But altho his brain was cleared, yet he was taken with a great weakness and numbness in his members, which distempers however were shortly cured with antiparyletic and antiscorbutic Remedies: But after a fortnight he began again to complain of an heaviness and giddiness in his head; then the next day after he fell into an horrid *Asthma*; that the Lungs being suddenly inflated, and endeavouring to come upwards, the Breath, which was very quick and laborious, was hindrod, and not being able to come forth, he was in danger every minute of an hour to be choaked. This fit, as it was cruel, so it pass'd over within Twelve hours, without any spitting, cough or vomit; and then, within a weeks space, he lost all the trouble of his breast; but then the like fit of the *Dyspnæa*, or difficult breathing, returning, exercis'd him somewhat more gently; and afterwards he was wont to be troubled with such a fit of the *Asthma*, nigh to the great mutations of the Air, chiefly in great cold, or falling of Snow.

2. Observation. I knew another Gentleman, sick of an inveterate Scurvy, who having no manner of Cough, was troubled now with a great head-ach, and for many days with a giddiness or *Vertigo*; then at another time, being free from those Symptoms, he was taken with a most cruel fit of the *Asthma*; and he endured these Distempers, now this, now that, frequently, but especially about the greater tropicks of the year.

The Reason. It is not to be doubted, but in the aforesaid Cases, those fits of the *Asthma* did wholly depend on the convulsive matter being fallen into the Nerves, serving to the stretching forth of the Lungs, which cleaving to the Spirits, and being by them struck off, or exploded, by reason of plentitude and irritation, caused the *Præcordia* to be lifted upwards, and, as it were, inflated, and by that means hindred from its reciprocal motion.

An Asthma sometimes excited by reason of the Bronchia being convulsively affected. Moreover we suppose, that such a kind of Convulsive *Dyspnæa*, or difficult breathing, is sometimes excited by reason of the *Bronchia* of the *Trachea* (or the sharp Arteries of the Throat) being too much much streightned, and often almost drawn together: We have shown in our discourse of the Nerves, that very many branches of nervous fibres, and of the Nerves, do every where embrace all the ramification of the asper Artery, and bind them about; which Nerves, if it happen that they being possessed by the morbidick matter, should be irritated into frequent Convulsions: for that Reason it follows, that the channels or passages which they compass about, must be greatly bound together, and in some places wholly shut up.

3. Observation. There was a very choice Virgin, of a tender constitution, and of a flourishing countenance, scarce past the second lustre of her Age (*i. e.* about Twelve years old), that began to be grievously tormented with *Asthma* fits; and before she was entrusted to my cure, she had liv'd obnoxious to them at least Four years: sometimes she remained free from any fit of this disease for two or three months: yet oftentimes, by reason of errors in Diet, or the great mutations of the year, or the air, she fell into most cruel fits of the *Dyspnæa*, or difficult breathing: So that the Lungs being inflated, and carried upwards towards her Throat, and there held almost in a continual Diastole, she could hardly, nay, not at all breathe: in the mean time, for that Respiration might be somehow made, the *Diaphragma*, and the muscles of the breast were exercised with repeated endeavours of motions. This kind of fit by degrees remitting within Seven or Eight hours, at length gave over; but then after a week or two it was wont to come again, either of it self, or from any the least occasion; after that the force of the Disease, its matter being bestow'd on very many of these kind of fits, pass'd away, this excellent Virgin was well enough for many weeks, yea, sometimes months after, and breath'd freely, without any fault of the *Thorax*: For this person I instituted this following method, Spring and Fall, and now, it is more than two years since she has had any fit of this Distemper.

Take of our Sulphur of Antimony, gr. vi. of Cream of Tartar, vi grains, mix them: Let it be given in the pap of a roasted Apple; with this medicine she was wont to vomit Four or Five times: Four days after she took this Cathartic, which was wont to be repeated

peated twice, after Six or Seven days between : Take Calomelun xii. grains, of the Resin of *Folop* v. grains, of *Castor* gr. iii. with what will suffice of *Ammoniac* dissolved, make iii. pills : Every day besides, the took morning and evening of the tincture of *Antimony*, grains xii. in a Spoonful of the following Julap, drinking after it Six or Seven Spoonfuls of the same. Take of the water of *Snails*, Ounces vi. of *Earth-worms*, Ounces iii. of water of *Penny-royal* and *Rue*, each Ounces iii. of *hysterical water*, Ounces iii. of *Castor* tied in a knot, and hung in the glass, 3℥. of *white-sugar*, Ounce i. mix them in the glass, and make a Julap.

About the Autumn of the last year, another noble Virgin, being sick after the same manner, viz. with a Periodical *Asthma*, I was sent for to cure her, who received great help by the afore said Remedies, being used in a little lesser dose, and the same repeated at the first of the Spring.

4. Observation.

In these Cases also, nothing seems to appear more clearly, than that the cause of the Disease, without any phlegm or viscous humour, being impacted in the Lungs, as is commonly believed, doth subsist within the nervous stock ; and that this kind of *Dyspnea*, or difficult breathing, meerly convulsive, is excited, by reason of the pneumonic Nerves, being possessed by the Convulsive Distemper. The verity of this may be yet more clearly evinced by an anatomical Observation, lately communicated to me by the learned Physician Doctor *Walter Needham* : That most famous man told me, That he knew a Butcher of *Walsullen*, in the County of *Stafford*, who when he had been long sick of a periodical *Asthma*, returning within 14, or 20. days at farthest, at length he died in a fit : The body being opened, all his *Viscera* appeared sound, chiefly his Lungs ; neither were there to be seen any signs either of Excrement gathered together in the *Bronchia*, or of the blood restagnating in the Veins ; this only hapned besides Nature, that the bladder of the gall contained in it many stones. But (added he) the causes unknown to us, certainly not conspicuous to our eyes, were to be attributed to the nervous stock, being affected.

An anatomical Observation.

Sometime past I was consulted with about about a noble child, who being about 12. months old, was grievously afflicted with Convulsive fits, and as it were Epileptic, of which he quickly died. I often observed, that whilst the Convulsion of the outward parts intermitted, he was taken with a cruel sobbing, or hooping Cough ; from whence I suspected, that the morbid matter was no less fixed in the breast than in the brain. But after its death, the Body being opened, the Lungs well furnished, appeared clear from any fault, that it clearly appeared, that this Cough meerly Convulsive, was excited by reason of the Distemper of the nervous stock.

Another Anatomical Observation.

As to what respects the Remedies, and curatory means, which ought to be used in the afore said cases, when that convulsive Symptoms come upon the Cough, or difficulty of breathing, first excited from the default of the Lungs, and so by reason of the taint, communicated to the brain ; it must be carefully heeded, that Convulsive Medicines be aply compounded, with those respecting all the intentions of the *Thorax*. Yea, that sometimes these, sometimes those, being given by themselves, may between whiles fill up the times of curing ; it will not be needful in this place to bring the bechic, or pneumonic medicines, and forms of them, since an immense company of them are extant every where among Physical Authors. It will be sufficient for our purpose, to add a method of Medicine, also some more select Remedies convenient for the Cough and *Asthma*, meerly Convulsive.

As to the former Distemper, which is most familiar to children, the cure is difficult, and for the most part not to be performed but of a long time. The chief Indications will be to purge forth both the ferous and sharp humours from the Blood and *Viscera*, that their inclination and falling down in the brain, and perhaps also within the breast, may be sometimes prevented ; then to corroborate those parts, that they may not easily admit the superfluities of the boyling Serum. For these ends, Vomits and more gentle Purges for the most part are useful, and in some measure ought to be repeated : Vefecatories are often profitable ; yea, if the Disease be contumacious, Issues are to be made in the nape of the neck, or the arm, or about the armpits : Drink and liquid aliments are to be taken in a lesser quantity than usual, and instead of them a Bochet is to be used of *Sarsa*, *China*, *Sanders*, *Shavings of Ivory*, and *Harts-horn*, with diuretic and anticonvulsive Ingredients : In this case, some Remedies, as it were special, are greatly commended, of which sort are pixed musk given in powder, or boyled in milk, and so given daily in a frequent dose : a decoction or Syrrup of *Castor* and *Saffron* ; decoctions of the Root of *Paeony*, *Mistletoe* of the Oak, also of *Hyssop*, help many ; the waters of *Black-cherries*, of *Saxifrage*, and of *Snails*, distilled with *Whey*, and appropriate Ingredients, are often taken with success.

The cure of this Convulsive Cough.

The cure of the
Convulsive
Asthma.

2. By what method, and with what Remedies I have cured the periodical *Asthma* in some young ones, hath been already shown; but in most distempered with this Disease, the most famous *Riverius* hath observed, a Vomit is chiefly helpful, altho he hath not rightly shown the Reason: which indeed seems to consist in this, to wit, That this medicine greatly shaking and irritating the Emunctories planted about the first Passages, strongly presses out from them, and carries forth of doors the recrements of the blood and nervous juice, apt to be troublesome, and to reſtagnate on the brain and nervous stock. *Zacutus*, the *Lusitanian*, highly extols, and not without Reason, a cautery to be made, sometimes in the hinder part of the head, sometimes in the nape of the neck, or about the Armpits: A preparation of *milipedes*, viz. in form of a dry powder, or a distilled liquor, seldom wants success. For by such like Remedies the superfluities of the *Serum* are deduced from the head and nervous stock, and carried away thorow the urinary passages: For the same Reason a gentle purge, evacuating the ill juice, is often us'd: for this end the decoction of an old Cock, with altering medicines, and gently purging, being stowed in its belly, is praised by many: Besides the Remedies hitherto cited, some others are said to be appropriate, and as it were specific to the *Asthma*, of which sort are, the *bassom* of *Sulphur*, *Turpentine*, also *Spirits* of *Harrets-horn*, or of *Sut*, impregnated with the same, *Syrrop* of *Tobacco*, of *Ammoniack*, our *diasulphur Loboeh* of *Garlick*, pills of the *Roots* of *Eluna Campana*, made up with the *milk* of *Sulphur*, with the *flowers* of *Benzoin*, with liquid pitch, or liquid amber, with many others, which would be too tedious here to enumerate.

And now the chief *Species*, and manner of *Convulsions*, together with the *Causes* of the *Symptoms*, and the means of curing, being sufficiently explicated, it is time to put an end to this our *Pathology* of the *Brain* and *Nervous stock*, and to our *Discourse* of *Convulsive Diseases*.

F I N I S.

Pharmaceutice Rationalis :
OR, AN
EXERCITATION
OF THE
OPERATIONS
OF
MEDICINES
IN
Humane Bodies:

SHEWING
The Signs, Causes, and Cures of most
Distempers incident thereunto.

In Two PARTS.

AS ALSO
A Treatise of the SCURVY, and the several sorts
thereof, with their Symptoms, Causes, and Cure.

By *Tho. Willis*, M. D. and *Sidley* Professor in the University of *Oxford*; Also
one of the College of Physicians in *London*, and Fellow of the *Royal Society*.

L O N D O N :

Printed for *T. Dring*, *C. Harper*, and *J. Leigh*, and are to be Sold at
the Corner of *Chancery-Lane*, and the *Flower-de-Luce* over against
St. Dunstan's-Church in *Fleet-street*, M DC LXXX IV.

THE UNITED STATES OF AMERICA

DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

WATER RESOURCES DIVISION

1880

REPORT OF THE COMMISSIONER OF THE GENERAL LAND OFFICE

ON THE PROGRESS OF THE WORK OF THE BUREAU OF LAND MANAGEMENT

FOR THE YEAR ENDING DECEMBER 31, 1880

PREPARED BY THE COMMISSIONER OF THE GENERAL LAND OFFICE

WASHINGTON

1881

THE
PREFACE
TO THE
READER.

WE have observed, that it hath been of exceeding great Benefit to many other Arts and Sciences, that Experiments and Observations either by chance or on set purpose being found out, that presently the *Ætiology* or the Reasons thereof, as much as may be, should be set down, which thing we have much desired in Physick, which may be justly placed amongst the noblest of the Sciences. In Mathematicks and Mechanicks, Experience and Practice did first assist the Theory, then this shewing the causes of things and the means of their effecting, hath not only adorned, but very much increased and illustrated the Practice. But the Mechanical Art, although at first known to *Empericks*, and taken up by quacking Juglers and old Women, as if it were a Mystery into whose Reasons it were not lawful to search, has remained hitherto unexplicated: Wherefore the unlearned, and indeed sometimes the learned at this time give Medicines (like People shooting at random) rashly and almost

The Preface to the Reader.

almost fortuitously ; being uncertain whither they will tend, or what end or effects they shall have. From hence it is, that not only some learned *Cynicks*, but the vilest of the scum of the people bark against and sling dirt upon *Physick*. And truly I know not how she will be wholly excused from being called a *Liar*, *Vain*, and *Jugler*, so long as yet the reasons of curing by *Medicine*, on which the life and health of Man much depends, and oftentimes by which 'tis no less indangered, lye hid. But this *Doctrine of Medicinal Operations* either neglected or ignored, shewing like a great *Chasm*, hath been the only, or at least the greatest Impediment that *Physick* is not come to its perfection, and its whole *System* rightly framed : For though the matter of *Medicine* gotten from each family of the *Vegetables*, *Minerals*, and *Animals*, seems sufficiently digested and compleated, and that the *Types* and *Natures* of all *Diseases* being collected by most accurate *Observations* are explicated by innumerable *Authors*, and besides that the *humane Body* as it were a *martial Field*, where those *Champions* try their Skill, be exactly described as to all its parts by *Anatomists*, yet what is of *greatest moment*, and without which the aforesaid things signifie little, is not yet sufficiently and clearly detected ; to wit, what the *Weapons* of those *Champions* are, what *Furniture*, what *force* and *Resistance* they have, also what *Action*, *Passion*, and *Reaction* may be between the *Particles* of the *Medicine* and the *Spirits*, *Humors*, and *Solid Parts*. But since almost the whole business of this *Pharmaceutick Drame* is acted behind the *Curtain*, therefore the various congressions of *Particles*, *Fermentations*, *Impulses*, and other diversities of *Motions*, which performed within, lye hid from the *Senses*, are to be searched out by

The Preface to the Reader.

by a more deep Scrutiny of the Intellect, which if it may be at last performed, there is nothing more will be desired, whereby *Physick* being performed in all its parts, may grow to a true Science and be practised with greater certainty, not inferiour to the *Mathematicks*. For so the *Empirical Remedies* left us by the Antients would not be administred promiscuously and amiss (as is wont now by *Medicasters*) in every state of the Disease or case of the Sick, but opportunely and always according to the most apt intentions of healing. Besides, new and more efficacious *Medicines* (as often as some great and unusual Diseases require them) may be easily and safely found out, without any error of the *Physician* or danger of the *Patient*. For whilst it clearly appears what kind of Particles in the *Patient* are either to be altered or stirred up into Motion, and what are required in the *Agent* for that work, it will be no difficult thing aptly to design this, and rightly to accommodate one to the other. But the business is far otherwise performed by those *Pseudochymists* with notable danger and abuse of the *humane Body*, who not contented with the use of received and approved *Remedies*, brag that they have framed in their Furnaces no less than a great *Elixir*, a certain *Panacea*, or an universal *Medicine*, whilst in the mean time they unskilfully meddle with *Minerals*, expecting a certain uncertain event rather than designing any thing seriously; If perchance there should appear an unusual product with this new *Medicine* (the Virtues of which are altogether unknown, or are none, or poysonous) they promise themselves presently to Cure all Diseases, and give it boldly in every case, to the great hurt, and not seldom to the Destruction of the Sick;

so

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so securely and rashly are these *Executioners* wont to sport with Man's Life, whilst they are led to the preparing or administering these Medicines (in which always lurks some *venomous Sting*) without any counsel or direction of Method, but by meer chance and with a certain blind undertaking.

Therefore it is highly to be wished, both for the Dignity (and Augmentation of *Medicine*, and for the Cure and Safety of Man's Health, that the Energies and Manner, as to the Nature of each, and as it were the Mechanical Means of the working of Medicines in our Bodies might be laid open. For if it shall be plainly known by what means *Medicines* being taken do presently exercise their powers in the first Passages, and from thence by and by diffuse them through the whole Body, and by what alteration they receive in each Region, and what they do or perform upon the Spirits or Blood, and Humors or Solid Parts, then indeed Evacuation may be much more safely and certainly used, and with greater Benefit to the Sick.

But if having boldly assaulted this Province, to wit, the shewing a reason of the *Pharmaceutical Operation*, before untouched, I shall not sufficiently perform my Work, I do however deserve Pardon, because I am forced to travel through not only an *unknown Country*, but also one that is *uneven* and as it were a *Labyrinth*; and if perhaps going through this Tract I have not yet sufficiently found out all the more secret Recesses, and every more intimate Corner, and what is acted in them; yet I suppose that I have made way for others, who may have a mind more accurately to find them out.

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For truly if these two things which I have followed in the whole Disquisition should be exactly known, *viz.* By what means *Medicines* or their *Particles* affect the *Animal Spirits* in every place, also by what and how many ways they Ferment the *Blood* and *Humours*, from thence a Path would lead to the unfolding the *Reasons* of every *Evacuation*. For the better laying open of the ways of the whole curing by *Medicines*, we have taken care to have accurately discribed the *Ventricle* and *Intestines*, even to all the *Membranes* and *Fibres* of them, in which the *Animal Spirits* dwell, and where they are first of all affected by the *Particles* of the *Medicine*. For although the *Substances*, *Figures*, *Cavities*, *Sites* and *Connexions* of these are long since sufficiently enough delineated, yet we have manifested most clearly without any Example or following of any other Authors, the *Nervous* and *Musculary* and *Glandulous Membranes* of each of them, and some *Fibres* meerly sensible, and others motional, as also the thick set enfoldings of the sanguiferous Vessels, and innumerable *Glandula's* incrusting the Back of the interior Coat from the Mouth even to the *Anum*, this making very much for the illustrating the *Pharmaceutical Doctrin*: concerning which *Anatomical Inventions* I must acknowledg my self to be beholden (as formerly to some others, so now again) to the Industry and sedulous Pains of the Learned Doctor *King*, and also my Friend Doctor *Masters* hath set to his helping Hand, in the finishing of this Task.

At the beginning of this Work I did design to handle the whole *Pharmacie* and to weigh the *Reasons* of all or at least its chief Operations: But whilst this
work

The Preface to the Reader.

work was under my Hands it grew into so great a Bulk, through the Fertility of the Subject, that I was forc'd to break off long before the end, and to finish it before I had half done. For besides the *universal Medicines*, whose Energies and manner of working we have already described, there are other *Remedies* (commonly called *Specifick* and *Appropriate*) which belong to this Speculation; to wit, which are given to cure either some peculiar Diseases, or which are said to respect some Region or part of the Body. Of some of these, and especially of Medicines proper for the Breast, I had begun some Meditations. But when I consider that I must Sail in a dangerous Sea, every where full of Rocks of Censures and Contumelies, I think it no Wisdom to venture my whole Cargo at once in this weak Bottom, but first of all with these few to try my Fortune, which if it be prosperous, I may perhaps be less affraid to expose the rest of this Nature hereafter.

S E C T. I.

Of the Operations of Medicins in Mans Body.

C H A P. I.

The Design of the Whole Work.

That Physick, from its Original down to the time wherein Hippocrates The Original of Physick lived, was meerly Experimental, is well known to all who have read the History of it. For several Men having tried several Remedies, if they found any thing that was helpful in such a particular case, they afterward applied the same upon the like occasion. Wherefore, as Herodotus tells us, the ancient Egyptians brought their Sick, not to Physicians, but into the Street, and publick High-ways, to desire the advice of all Passengers, in order to the Cure of such or such a Disease. Nay not only in Egypt, but in Greece too, the Priests took in writing the Receipts for each Cure, and laid up their Observations in their Temples, that they might be in readiness as oft as any other distempered persons should have need of them. But when through the daily and vast increase of Observations, Physick began to be reduced into Rules and Method, their whole business was, first, to take care that their Medicins were well prepared, according to the best Prescriptions; and Secondly, that the Reasons or Circumstances, why and when they were to be used, might be as plainly known. Now therefore if any one understood both these Parts of Physick, he was esteemed as an absolute Doctor. But indeed, in this affair, as well as in the whole Practice of Physick, we may truly say, we want some body or other to tell us, how and by what means all Medicins, inwardly taken, or outwardly applied, perform their operations; to wit, First, How, and why one gives you a Vomit, another a Purge, a third causes Sweat, Alteration, or some other Operation: Secondly, What agreement or disagreement there is between the bigger, and the smaller parts both in the Agent and the Patient, as likewise what Motion backward or forward. And Thirdly, What a struggling (as it were) and Fermentation there happens, when such parts mix with one another, and after what manner they produce their effects. To all which the vulgar answer is, that Medicins work by certain specifick Virtues, whereby they exert their peculiar strength and power: which is indeed no more than if a man should say, such a thing is so, because it is so. As when it is said, some things are apt to make People vomit, because they have a faculty of moving us to vomit. Since therefore the knowledge of Medicinal operations hath been hitherto left almost untouched by all Physicians, it seems worth while to inquire concerning that mechanical way (as it were) whereby all sorts of Medicins work upon our Bodies, so that, as we please, they either purge or bind, raise or allay heats in the Blood and Humours, or relieve the necessities, and make amends for the irregularities of every particular part or member in some peculiar manner. For the performing whereof, although it be not of any great moment in what order the several sorts of Medicins are set down; yet, for Methods sake, I thought fit first to give some general account of them, and then accordingly to reduce them into their proper order. We therefore ought first of all to distinguish the several places, in which Medicins begin to operate, and are commonly divided into three regions, that is to say, First, The first Passages, in which are chiefly comprized the Stomach, Guts, Passage of the Gall and Sweet-bread, together with the Mouths of the Mesaraick Vessels. Secondly, The Mass of Blood, with all its bloody appendages, as the *Præcordia*, the Liver, Spleen, &c. And Thirdly, The Brain, and Nerves, with all the Members and the Habit of the Body. But besides these several Spheres of Activity, of which sometimes this or that apart, and sometimes more of them, or all together are affected by a Medicine. We must moreover in the second place consider those immediate Subjects upon which Medicins work, which indeed are not solid parts, but either the Animal Spirits or the Humours: though the former are sometimes moved by mediation of the latter. Medicins

Phar. Rat.
Part. I.

How they operate upon the Spirits.

The several sorts of Humours.

How Medicins operate upon them.

The Method of this Treat. &c.

Three things to be observed in every kind of Medicin.

inwardly taken work either immediately upon the Animal Spirits that are in the fibres of the Weazon, Stomach, Guts, and other passages among those we call the first; or, by mediation of the Blood, upon them that reside in the Brain, and in the nervous or membranous fibres of the remoter parts. When therefore the virtue of such Medicins makes any impression upon those Spirits, it either provokes and moves them toward purgation, or cherishing and recruiting, makes them expand themselves with a kind of delight, or by asswaging of them appeases and removes all things that discompose or molest them; or lastly by over-powering of them lays their fury asleep. The Humours upon which Medicins inwardly taken work, are both the Ferments, and slimy coverings of the Stomach and Guts, the Blood, with the nutritive Juice and other less noble Humours, as the Serum or Whey of the Blood, both kinds of Choler, the Prancreatick or Sweetbread juice, the Watery Humour, and the Nervous Liquor: upon which sometimes severally, and sometimes jointly Medicins use differently to operate, in as much as that they either scatter and make them sink, or alter their present temperament, by sometimes stirring them up when they are dull and heavy, or cooling and asswaging of them when too hot; or lastly by changing and restoring them gradually to their natural constitution when they are irregular in quality, consistence, mixture, and other accidents. Seeing therefore that the considerations touching the operations of Medicins are so many and various, I will treat of them in order according to the places where they first and chiefly begin to work; and first of Catharticks, or cleansing Medicins, both Vomits and Purges: Next of Diureticks, or Medicins that provoke Urine; Diaphoreticks, or such as cause Sweating, and Cordials; and lastly of Opiates, or such as cause Sleep, &c. and those that are commonly called Specificks, that is, such as are applied to the irregularities or defects of each particular Member or Entrail. In the handling of which I will observe these three things:

1. To shew the manner how each kind of Medicins operate upon the Humours of Spirits of a Mans Body, or upon both together, and likewise how they affect the solid parts.
2. To set down the several sorts of Medicins in each kind, or at least the chief of them, with the most choice Receipts: And
3. To tell you the best Chymical Remedies, relating to each of those sorts, together with their Causes; that is to say, the variety of changes and accidents that happen in the preparations of them, and the reasons of those virtues and effects which are so manifest in them when prepared.

But in the fourth place, there might be added to all this another Tract also concerning the Nature of Medicin, to shew how, when the causes of Chymical Preparations are rightly considered, there may be neater and more useful provisions made of such kind of Remedies: But I shall reserve that Design till another time, because it comprehends many Secrets which may be easily transgressed by rash Quacks, who, to the great hazard of the Sick, (but unpunished) do at this day often make up Medicins which they can onely read. The next thing therefore that I have to do, is briefly and accurately to describe the first Passages, as they are commonly called, in which Physick begins to work, being as it were the first Scene of each medicinal action.

C H A P. II.

The Description, Uses, and Affections of the Parts in which Medicins begin first to operate.

Since Medicins and Food go into the Body of Man the same way, and are conveyed through the very same passages in all respects, it is therefore necessary for the understanding how Medicins work, as well as how Chyle is made and distributed, to give you a kind of Landſchape of those Parts and Entrails, in which the actions of both are performed. But to make this a full and perfect Work, would be to write the whole Anatomy of Mans Body. Wherefore I shall briefly describe onely those parts, into which Medicins are first received, and where they begin to work. Now these are the Weazon, Stomach, and Guts, with their appurtenances, in which not onely Vomits and Purges, but also Cordials, Opiates, and Diaphoreticks, with other Medicins of all sorts do first exert their Virtues, and are determined to every operation. I therefore will not trouble you with a perfect description of them (because that hath been done very accurately already by other Anatomists) but will give you onely some short account, enough to illustrate this practical part of Physick. And again, since all Medicins work more immediately upon the Spirits, or Humours, or both together, and that the Subjects in which they reside, are the Fibres, Membranes, Vessels, and Passages, I will particularly shew you how these stand, and use to be affected in the aforesaid Entrails.

The first Passages.

Spirits and Humours are the first Subjects upon which Medicins work; and fibres, &c. the next.

1. The Weazon, according to the common opinion and observation, hath three coats, whereof the inner hath a kind of vail on its inside, consisting of fibres, like unto small hairs, which covers all its cavity as it were with Down; but the other part of this same coat is altogether nervous, and full of fibres, not onely of various sorts but also variously interwoven, just as the inner coat of the Stomach and Guts. Moreover this membrane is continued to that which covers the Palate, Mouth, Jaws, and Lips; nor onely so, but it also descends as low as the Stomach, and covering the mouth thereof, goes down into it three inches all over the sides. Now this lower part of this same nervous coat, within the orifice of the Stomach is very thick and hairy, and appears much different from the inner coat of the Stomach which it covers; as you may more fully discern when it is parboiled: for then that coat which comes down from the Weazon, is much whiter than the inner one, which belongs to the Stomach. That part, no question, contributes very much to exquisite, nice Sensation. For hence it proceeds, that when we take in and swallow down grateful food, we feel a sort of pleasure even till it enters the Stomach: and so on the contrary, if we eat, or but remember any ungrateful thing, there is such a disturbance in this part, as that we presently heave or vomit. And the deep insertion of this coat into the Stomach, causes that near and speedy commerce between the Stomach and the Weazon, in so much that if either of them be moved to Vomiting, the other presently sympathizes; and being that the same coat covers the Palat and other parts of the mouth, they all agree in a mutual consent to vomit.

The Weazon hath 3 Coats.

The inner Coat is nervous, but covered with a kind of Down.

It goes into the mouth of the Stomach, and covers it for some space.

It creates a sense of Tasting in the Weazon and in the mouth of the Stomach.

2. The next Coat belonging to the Weazon is very fleshy and thick, as if it were a Muscle with a hole bored through it: and *Hofman* says it is really a Muscle, obnoxious both to the Palsie and Convulsions. Now the fleshy fibres of this coat are commonly thought to be round and transverse, but the famous *Steno* hath observed them to be spiral, and in a double order or rank; that is to say, going cross each other, and resembling, as it were, two Cockles or Snails set opposite one to another. Of which, that I may tell you what I find by mine own observation; the whole Weazon seems to consist of two Muscles put together, which makes four parallel lines with the fibres that are opposite and cross each other. And this will plainly appear, if this middlemost coat of the Weazon, being stript of the rest, and bound at both ends, be blown full of wind, and dipt into boiling Water till its fibres be contracted and swell; for by that means there will two rows of descending fibres discover themselves and their tendons. But then again, if you turn this same coat upside down, and blow into it the other way, the opposite ranks of ascending fibres will likewise appear. Lastly, if it be cut lengthwise between the tendons, and laid fairly open, you shall see two parallel lines on one side and as many opposite on the other.

The second Coat of the Weazon.

Two opposite ranks of fibres that cause motion.

3. The third and outmost coat of the Weazon, which is common to that and the Stomach, and hath its rise from the Midriff (to which it is united whilst it passes through

The outmost Coat of the Weazon.

Phar. Rat. the hole thereof) is very thin, consisting onely of membranous fibres, and those mighty slender too.

Part I.

An inquiry into the use of these Coats.

As to the use and duty of these Parts, I say in general that the Inner coat is made chiefly for Sensation [by the Taste], the middlemost for Motion, and the third for a covering to them both. But it seems worth our while, since these are the first avenues or gates through which all Medicines pass, to enquire a little more largely and particularly into them.

What the hairy Covering serves for.

First therefore, Whereas the Inner coat of the Weazon is covered all over with an hairy vail like Down (which is also common to the Palat and the Tongue) the reason seems to be, because it may the more invite us to eat, which is an action so necessary to the preserving of life; I mean, that whilst we swallow grateful food, it may be caught hold on all along as it goes down the Weazon, by those small hairs, and sticking sometimes in them, imprint a sense of pleasure upon the part. But the coat itself being made of nervous fibres onely, which are variously interwoven, contributes very much first to Sensation; next is thereby the stronger, like a Basket made of Twigs; and Thirdly may be the more easily stretched out. But their chief use is to receive all sensible [or tasteful] things, and presently to deliver them over to the common Sense, to the end that as they are there judged pleasant or unpleasant, the motions of swallowing or vomiting, may be either continued or renewed.

The nervous Coat is made for Sensation.

Whether it serves for Motion too?

But in this place it may deserve our inquiry, Whether this coat which is altogether nervous, being interwoven with so many and various fibres, serves also for any motion? For since we know that the Weazon, and all the parts of it are moved several ways in Swallowing, Spitting, Vomiting, Yawning, and the like; and likewise that other membranous Entrails (as the Stomach especially, and the Guts) are drawn, blown up, and distended into various figures, we ought to explain by what Fibres, and how it comes to pass, that such various actions and passions happen.

Fallopious his Opinion of the motion of Membranes?

Fallopious, the best Anatomist of his time, having observed in that Muscle (which is the chief or onely instrument of local motion) two parts; the one containing the fleshy body of that Muscle, and consisting of fleshy Fibres, as the other, which contains the chord or string, does of nervous ones; and that by these two, the body onely of the Muscle moves and contracts it self, whilst the chord is onely passive and doth not move it self: at last concludes, That no part in any Animal moves it self, unless it be fibrous, and made of true Flesh. *Observ. Anatom. p. 412.*

That Contractions are performed by Fibres onely.

According to his opinion, I have lately shewn in a peculiar Tract, not onely that it is so, but also how all Contractions are performed by fleshy Fibres onely; to wit, That these Fibres being suddenly blown up and swollen through the hasty infusion of the Spirits (which gush out of the tendinous Fibres) are presently shortened, and consequently draw the connected parts toward them. But since it also very plainly appears that some nervous parts, and especially the hollow Entrails, are not onely contracted, but also expanded, much bloated, and enlarged into a greater width (which cannot be by contraction,) and since it likewise is very manifest, that the Animal Spirits within the nervous fibres, are moved no less than in the fleshy ones; as also that in them they flow not onely very gently, but sometimes are disturbed, and discharged with great violence. These things, I say, being presupposed, I affirm, That the Animal Spirits which are in the nervous or membranous Fibres, cause not onely perception, or sense, (which is their proper office) but also some kinds of local motion, as Expansions, or Inflations [or Widenings and Bloatings.] For when the Animal Spirits upon their discharge are mightily rarefied, and thereupon violently enter these Fibres (which contrary to the fleshy ones, are not ranged in certain rows, but scattered every way, and may be attenuated, distended or dilated into a greater compass) it necessarily follows, that any Entrail consisting of such fibres, must be totally blown up, and that every side of it being unfolded, and laid smooth, must be attenuated and enlarged into a greater capacity or extent. And indeed if we consider the design of Nature, it is convenient that sometimes it should be so, to the end that whilst the parts which are either composed of Membranes, or otherwise supported or covered by them, are thus expanded [or widened] the superfluous or vicious Humours, which are settled in them, or stick to them, may be cleared and carried off. To this end, and by this means I suppose stretching, yawning, and some other motions of Inflation and Distention are set on foot. Upon which account, since we see that in yawning the passage of the Weazon is widened even whether we will or no, and as it were filled with wind, or expanded, we may conclude the reason of it to proceed from the inner coat of the Weazon, which, to relieve it self from that immoderate moisture (with which it is oppressed) is widened and enlarged by a kind of explosion, or discharge of the Spirits. Moreover, when we endeavour to hinder our motion to yawn (because it seems always troublesome and indecent)

That Expansions are caused by the nervous Fibres.

As in Stretching, Yawning, &c.

The reason of Yawning.

cent) immediately the fleshy fibres of the outward coat are contracted : from whence there arises in the coats of the Weazon a kind of struggling as it were, between these opposite endeavours to stretch and contract them. How the Animal Spirits in Convulsions do so much inflate, or blow up, and raise the membranous Entrails, and swell them with a motion like the skipping of a living Animal, I have shewn in another place. But to proceed; The reason why an ill Medicin, or Poison causes such horrid distentions and inflations of the Stomach and Guts, and also oftentimes such sudden and extraordinary swellings in the whole lower Belly, is, because the Animal Spirits being extremely disturbed, and forced to a violent explosion or discharge, run all together into the membranous fibres, and extend or stretch them out to the utmost; that the Entrail which is made up of them, may be immediately filled with wind, and enlarged as much as possible. But now, having digressed in this Discourse concerning the motion of Membranes, let us consider the use of the other coat of the Weazon.

Phar. Rat.
Part I.

The reason why the Membranes are distended.

The middlemost Coat of the Weazon is fleshy and consists of two ranks of motive fibres.

2. The middlemost coat of the Weazon being very fleshy and thick, as consisting of two ranks of fleshy fibres, which ascend and descend obliquely across one the other, ought to be reckoned, as it were, a double Muscle; and since the one row of fibres so descending serves for swallowing, the other questionless, ascending, performs the offices of Spitting and Vomiting. I have known some, who having a Palsie in this fleshy coat of the Weazon, have been hardly able to swallow; and others, who through the relaxation or total loosening of those fibres, have died for hunger. Besides which, we may guess, that the sense of being choaked as it were, and the ascent of somewhat like a round Ball in those that are troubled with Fits of the Mother are occasioned by the nervous fibres of the inner coat being too much swelled and distended, when the Spirits that are in them are exploded or discharged.

But 3. Of the outmost coat of the Weazon I need not say much; for that, as it consists of very small and membranous fibres, so it seems to be designed onely for a covering to this same Entrail.

A description of the Stomach.

Secondly, The Stomach (in which the Weazon ends, and inserts its nervous coat into the left orifice thereof) is long like a Sack, with a large round bottom, and a plain short top, wherein there are two orifices [or mouths] placed opposite to each other at some distance: through the left of which the meat descends in a streight perpendicular passage down into the Stomach, and being there dissolved and changed into Chyle, ascends again through the right orifice, whose passage is oblique, and goes into the Guts; so that whatever passes out of the Stomach at either door, goes upward; and therefore, that the Stomach may discharge what is in it, either the left way by Vomit, or the right way by Stool, it is necessary that the bottom and sides of it being at the same time contracted and raised up, should lean altogether to this or that orifice.

So much for the outside of the Stomach: Now we ought further to consider in this Entrail (as it relates to practical Physick) the coats of it, together with the texture [or interweaving] of the Fibres; as likewise its orifices, vessels, and passages, with all their actions and uses. Now the Stomach, just as the Weazon, consists of three coats; the one common, which rises from the Midriff; and two proper, to wit, an outward, and an inward:

It hath three coats.

Of which the innermost is altogether nervous, and (as I said of the Weazon) covered on the inside all over with an hairy substance, like small strait threds, fastned perpendicularly into the coat it self, as you see in Velvet. This Vail or Covering, being spread all over the inside of the Stomach, appears very plainly after it is a little boiled, though different from that which lines the Weazon (as being thin and not so white) but is like to that which covers the Tongue. For the surface both of the Tongue and Stomach too, ought to be rough, as it is, that the small parts of Food which we taste, or swallow, may be detained in it for some time, and then by degrees delivered over to the nervous coat, which might otherwise be in danger of being too much affected by their naked and immediate touching of it, and thereby grow harder and less sensible. But this hairy Vail of the Stomach serves likewise for other uses; for in that the reliques of the Chyle being gathered together, and kept till they become acid, or sharp, turn into a kind of Ferment, which is requisite both for the appetite and digestion. So also this same Down, not onely covers but guards the mouths of the Vessels, which are very numerously inserted into the nervous coat, and receives the Humours which issue out of the Arteries and Nerves, whilst at the same time the Veins suck out the Chyle or other Juices which abound in this part. But this hairy Vail or Covering, on its back-part or convex surface, by which it joins to the nervous coat, is all over set with annular or round glandules [or kernels] to a vast number, which, no doubt, cover the mouths of those Vessels which lie open in the nervous coat,

The inward one is nervous and covered with a kind of Down.

The uses of the hairy Vail.

Phar. Rat. coat, and probably do more immediately receive and strain the moisture designed for them, or discharged by them.

Part. I.

This hairy Veil is a Coat by it self.

The nervous Coat is full of little Bloud-Vessels.

This hairy Veil or Covering is easily separated by dipping the Stomach into boiling Water, and then it appears to be a coat, firm enough of it self, and distinct from all others; and may (for the reason just now given) not improperly be called *the glandulous coat*. When this therefore is taken off, the nervous coat it self appears, consisting of fibres of divers kinds, and variously interwoven; through the thin web whereof (described in the Figure *A.A.*) an innumerable company of Bloud-Vessels spread themselves into a thousand little branches, and terminate in the inner surface of it, where they join to the glandulous coat. Parts of both these Membranes, to wit, the nervous and the glandulous too, are represented by Figures in the Fourth Table.

The use of this Coat is full of Sensation.

This nervous coat makes the inner cavity or hollow of the Stomack, like a Chymical Vessel, called a Matrace, in which the Food is dissolved and digested into Chyle: and the Fibres of it contribute chiefly to Sensation, but it may be, in some measure, to motion too. As to the former, these Fibres being emptied create hunger, and being wrinkled through drouth or saltiness, or heated with Aromatick or Winy Drinks, make us thirsty; but if at any time sharp or acid humours either prick or gnaw them, we have the Heart-burn. In fine, all Medicins work chiefly upon these Fibres, and according to the sensible impression made upon them, such or such an operation (as I shall hereafter shew) succeeds. As soon as these fibres are filled with convenient food, which is conveyed into the Stomach, immediately the Spirits that are in them receive a kind of pleasure and satisfaction, and then, by an universal consent of them all, the sensitive soul in general is refreshed, and does as it were rejoice, whilst at the same time the Veins strait suck up the thinnest part of the Chyle, and supply the flame of Life with new combustible matter.

The motions of it.

As to the motion of this coat, though we utterly deny it to make any spontaneous contractions, yet it is plain enough that it is frequently distended, blown up, swollen and enlarged into a greater compass: and that proceeds not onely from wind that is bred within the hollow of the Stomach, but much oftner from the Spirits that reside in the fibres themselves; which Spirits if they are very much disturbed and forced upon an explosion or violent discharge, and run all together tumultuously into the fibres, they blow them up, and stretch them extremely, so as to make the whole membrane swell like a Bladder full of wind. For if those nervous fibres were all hollow like so many small tubes, or pipes, and suddenly filled with wind, it would necessarily follow that the Vessel, which is made of them, must be as soon distended and dilated or widened. So it is, when the Spirits, being stung as it were, with some great disturbance, rush violently into them. And upon this account it is, that the Stomach in Fits of the Mother, and of the Cholick, as also often in [the Spleen or] Hypochondriack Distemper, the Stomach uses to swell. Hence also comes the Hickock with its reciprocations or returns, for that the Stomach is one while blown up and filled with wind as it were by these fibres, and another while emptied again by the Systole or contraction of the Midriff. In fine, all venoms and poisons in respect of their extraordinary stimulating and disturbing of the Spirits, and forcing them to run furiously into the fibres, do often cause horrid distensions and swellings of the Stomach and other Entrails; and from some such cause I affirm also the Tympany to proceed.

The cause of the Tympany is hinted at.

The reason of the wrinkles in the inner coat of the Stomach.

This inner Coat in sound Bodies hath many wrinkles or folds in it, which appear in the concave surface of the Stomach, and look like so many little ditches or furrows, in which the several portions of Chyle, being dispersed in very small quantities to divers apartments, might be the better detained from each other in order to concoction, and not suffered to run together into one thick mass. The reason of these folds is, because this coat is much larger than the fleshy one which is more outward; wherefore that the former might be contained by the latter, it was necessary for it to be contracted or gathered into wrinkles or folds. But in Drunkards and Gluttons, whose fleshy coat is very much stretched through their frequent and immoderate gormandizing, the inner coat also is of the same extent with that, and loosening all its folds, becomes plain and thin like a Bladder blown full of wind. The aforelaid wrinkles and folds are expressed in *Tab. 4. Fig. 1.*

The fleshy Coat of the Stomach.

2. The next coat of the Stomach which is both proper to it, and altogether fleshy, consists of none but fleshy fibres, and seems to serve onely for several motions, and those onely contractive. Indeed the whole Body of the Stomach is covered with this membrane or fleshy cloak, which contracts and composes it very differently according to the various uses and offices that occur. For since the Stomach, in the work of chylification [or making of Chyle] and the operations of Medicins ought to be altered and

and modified into several postures, for that reason this coat contains many ranks of moving fibres, which are mighty admirable. Now though it be difficult to describe them, as being very intricate, yet because it very much concerns the Nature and operation of Medicins, I therefore shall endeavour according to my best ability to give you the particular Anatomy of it, which has been hitherto scarce touched upon by any other hand.

Phar. Rat.
Part. I.

In order thereunto, let the Stomach of a Man or a Sheep, being emptied, and blown full of wind, and then tied at both ends, be dipped several times into boiling Water till the fibres are by degrees contracted and swell, and the whole seems parboiled; and then take notice of the outmost coat, or membrane, which covers the whole Stomach. The fibres of this coat running out from one orifice to the other, encompass the bottom and sides of the Stomach all the length of them, and according to the different use of them, are either longer or shorter, more strait or crooked. Besides which, in some places, that is, near the orifices and about the bottom and ends of the Stomach they are much thicker than in the middle, in so much that they there seem fleshy, and in some measure subservient to motion. The nervous fibres of this membrane (as you may observe in many Muscles) cut fleshy fibres that are immediately under them at right angles; it being their office not onely to cover, but to bind and keep each one of them within their ranks, so as not to let them start out: The Figure of which is well represented in *Tab. 2.*

The Anatomy of
the Stomach.

Of the outmost
Coat thereof.

When therefore the outmost coat is separated and removed, a row of fleshy fibres lies just under at right angles; which encompassing the bottom and sides of the Stomach by way of depth, are terminated in the plain upper part of it (which is the distance between the two orifices) and in the orifices themselves. Without all doubt, the use of these Fibres is, whilst they are contracted, to raise the bottom and sides of the Stomach, and consequently very much to streighten the cavity or hollow of it, so that the meat or other matter therein contained, being elevated, may be discharged through this or that orifice. The outward, or convex surface of this fleshy coat, together with the rank of moving fibres is exactly delineated in *Tab. 3.*

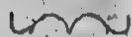
Of the middle-
most.

But to determine its expulsive motion toward this or that orifice, and that the matter included in the Stomach, may be conveyed both by Vomit or Stool, there needs also another row of fibres, which in respect of the former, are transverse, and draw one end of the Stomach, to wit, the right or left, toward the other, so that when both these kinds of fibres act at the same time, the Stomach being contracted in all its dimensions, and raised up, may throw out what is in it through that orifice, to which upon occasion it is inclined. And indeed, that there are such fibres just under the former, is very manifest to any one that takes notice of the other, inner and concave surface of this Coat. Let therefore the Stomach be turned (through the orifice of the *Pylorus* being cut a little wider) with the wrong side outward, so that the inner and concave surface may become the outward and convex, and by that means the hairy covering of that inner membrane, together with the wrinkles and folds (as it is formerly described, and expressed very well in *Fig. 1. Tab. 4.*) will plainly appear. Then after a little dipping of it into boiling Water, let the hairy veil be taken off, and thereby we shall discover the nervous coat it self, which is covered all over with vessels that spread into an innumerable company of little branches: portions of both which I have taken care to get represented in *Fig. 2. & 3.* of the same Table, that the surfaces of them, with the glandules and vessels, whereby they are joined together, might be discerned. Lastly, If you take the nervous coat quite off, the inner fibrous surface of the fleshy or middlemost coat will appear, as it is lively expressed in the fifth Table. The order therefore in the branching of these fleshy fibres is very observable, in that they seem to arise behind the mouth of the Stomach, and so encompassing its left side to be carried forward toward the right. A considerable number of these are conspicuous in the neck or top of the Stomach, which running along in strait lines on both sides, go into the *Antrum Pylori*, or hollow of the *Pylorus*, and covering that cavity of it here and there, the whole length of it, are terminated in the very orifice, as is represented in the fifth Figure. But the other fibres of this rank go obliquely on both sides of the Stomach, and forward toward its bottom, where they meet. The use of the former seems to be, to draw either of the orifices toward the other in discharging [what is within] whether upward or downward; for the same fibres pull either to the right or left, according as the attractive motion begins from the one or the other end; as I have lately shewn in my Treatise touching the motion of the Muscles. If then the contraction begins near the *Pylorus*, [it so happens that] whilst there the bottom and sides of the Stomach are gathered up by other fibres both outward and inward, the mouth of the Stomach also is bowed toward the *Pylorus* by these strait ones, to the end that what

The use of its
Fibres.

The same fleshy
Fibres cause
opposite contractions.

Phar. Rat.
Part I.



what is in the Stomach may be transmitted into the Guts. But if on the contrary the contraction begin in the other ends of these fibres near the mouth of the Stomach, [it thereby comes to pass that] whilst the bottom, and sides of it are drawn that way by other fibres, the *Pylorus* also at the same time is pulled toward it, as in vomiting. As for the other oblique fibres of this rank, when the motion begins from their right ends, they are contracted obliquely downward, and by their force incline the left part of the Stomach toward the bottom and the *Pylorus*, to press the meat (as it concocts) the nearer together, and roul it down that way: So on the other hand, if the motion begin at the left ends, that are contracted obliquely upward, making the bottom and right part of the Stomach yield toward the mouth of it, to give you a Vomit. Now according to both the contractions of these fibres, the fleshy ones that are outward and make up the convex surface of the middlemost coat, do (as it were) conspire in their action, and thereby rendring the cavity of the Stomach more streight, make it the fitter for evacuation either upward or downward. Wherefore according as by the irritation or first motion in the one or the other part of it, the contraction begins near the *Pylorus*, or the mouth of the Stomach, the whole cavity thereof is drawn together, raised and bowed either one way or the other, to cause a discharge either upward or downward. Both surfaces of this coat, with the distinct rows of moving fibres in each of them, I have taken care to get exactly delineated by Figures in the third and fifth Table. It is not my business here to recite and explicate the several sorts of contractive motions that this fleshy coat of the Stomach performs, in that I have already shewn elsewhere of what kind those are, which happen in convulsive distempers, and do design to demonstrate the nature of those that are caused by the operations of Medicins, when I come to treat particularly of them. Yet in the meantime I observe to you, that the instinct or occasion of those motions which this fleshy coat uses to perform, is communicated and given to it several ways; as first and chiefly from the nervous coat that lies under it; which as it is variously affected by that which is in the Stomach, does presently provoke the fleshy coat to contract it self one way or the other, either to keep in or drive out the matter therein contained. But the nerves that are inserted into this fleshy coat infuse into it several instincts or dispositions to move down from the Brain or other parts, whether near or remote, below or above. And hence it is, that the Phanisie, Appetite, yea many Affections, [or indispositions] of the Soul, or of any parts of the Body, disturb the Stomach and cause it to move different ways.

How the fleshy
coat comes to
move.

The outmost
coat of the Stomach
is wholly
nervous.

3. The outmost coat of the Stomach, which is common to that and the Weazon, I have already described, as to its substance and make: as to its use, it being the cover of the whole Stomach, invests or cloaths (as it were) the fleshy fibres of the coat that lies under it, binding them with its fibres, as it were with twigs one to another. The fibres of this membrane are (as I before observed) in some places thicker than ordinary, to the end that when the Stomach is extraordinary full, it may be proportionably distended or stretched out. These seem to serve but very little for motion, but for sense they do in some measure: though indeed there is mighty little use of it, because no outward object, nor any thing that is taken in at the mouth can reach it. But if the serous Humour [or wheyish moisture] an abscess [of irregular gathering of any ill Humour] or a constant flux of choler happens in the adjacent or contiguous parts, it causes almost a continual nauseousness, want of appetite, and frequent vomiting in the Stomach, by reason that this coat is often and much disturbed, as I have observed in many Bodies which I have dissected. Now the chief use of this coat is, that, being a cover to the whole Stomach, it invests or cloaths the fleshy fibres of the membrane under it, supports the branches of the vessels, and serves to strengthen the Stomach as well as to preserve the heat thereof. Nor is it improbable, but that in some places the nervous fibres of this coat, in respect of the fleshy fibres that are under them supply the room of tendons.

The use of it.

Two orifices in
the Stomach.

The Stomach being made up in this manner, like a Snap sack, of these three coats, as it were a three-doubled piece of cloth, hath two doors, or orifices, which are placed on the top of it, just against one another. The one on the left side, consisting of the Weazons insertion into the mouth of the Stomach (and looks like the Pipe of a Funnel put into the neck of a Bladder, which is to be filled [with any liquor] that streight and perpendicular passage whereof, lets every thing that is taken in and swallowed, into that part. The other orifice is on the right hand, continued to the *Duodenum* [or Gut of 12 inches long] by a long, oblique ascent, and by degrees discharges the Chyle that is prepared in the Stomach, into it.

Nerves belonging
to the
mouth of it.

The nerves of *Par Vagum* [or the straggling Pair] being brought down to the Stomach, as their ultimate bound or limit, make, near the left orifice, very notable plaits,

or

or a kind of Network, which covers it all over : and so likewise the hairy and nervous coat of the Weazon invests and clothes the cavity of it pretty deep: from whence it proceeds, that the mouth of the Stomach being a part of very acute and exquisite sense, hath such a communication with the other noble parts, and especially with the Brain and Heart; so that it is not without some reason that *Helmont* makes this the seat of the Soul.

Phar. Rat.

Part I.

The other orifice, commonly called, the *Pylorus*, going from the right side of the Stomach with a long wide hollow, that grows less and less by degrees, till it becomes very streight, ends in a small hole, from whence being retorted, or turned back again, it is continued, or joins to the *Duodenum*. The coats in this part are much thicker than in any other part of the Stomach. Of which the inmost being nervous, hath many uneven wrinkles and furrows in it, and at the very hole is raised into an oblong bulky figure (like a Cock in any Vessel) to the end that the Chyle when it is gone leisurely out of the Stomach, may not rejoyne again into the Stomach. The fleshy coat, as in all other places, hath two rows of fibres; for some of them encompassing and binding this Hollow, do upon occasion shut it, whilst others running out in length all over its sides, and gathering the other parts of the Stomach upward, draw them toward this orifice. And so on the contrary, these fibres, when the contraction begins at their other ends, do often draw the *Pylorus* toward the left orifice, as in Vomiting: but when the attractive force is augmented and carried farther, the *Duodenum* is drawn upward and thereby the choler with the Pancreatick liquor [or humour in the Sweetbread] is discharged into the Stomach.

A description of the Pylorus.

The use of the *Pylorus* is not onely to transmit that which is in the Stomach freely and in a great quantity to the Guts (as it often does in a Purge or Loosness) but rather to receive the Chyle, when it is well prepared, and having for some time retained it, by little and little to send it forth. For the long and wide hollow thereof seems to be a kind of retiring room where the more perfect part of the chyly mass may go apart and stay, till the other and more crude part, which is more newly taken in, be better digested in the bottom of the Stomach. Hence it is, that among those things that we eat, we oftentimes quickly vomit up what is ungrateful, whilst the more grateful part of the food stays in the Stomach; in as much as there are in the Stomach several distinct cells, or little rooms, wherein the parcels of meat may retire and stay apart from each other. Besides which it is observable that Vomits when they work gently, provoke or move onely those parts that are next the left orifice of the Stomach, but when they operate more strongly, draw the *Pylorus* also, and the *Duodenum*, which is joined to it, inward and upward, and by that means cause an evacuation of the choler which is violently hurried into the Stomach.

The use of the Pylorus.

The Vessels belonging to the Stomach are Nerves, Arteries, and Veins: of which the former are described pretty accurately in my Book called *Neurologia*, or a Treatise of the Nerves; that is to say, That the Nerves of the *Par vagum* on both sides ending in the Stomach, make notable branches and plates in it; as likewise, that the nervous plates of the *Par intercostale* [or Pair running between the ribs] being spread here and there in the *Hypochondria* and the lower Belly, send many sprouts, and those very considerable ones too, to the stomach: Which is the Reason that in Fits of the Mother, the Cholick, and Hypochondriack distemper, people so often vomit.

The Vessels of the Stomach.

Nervus.

There are also a great many Bloud-vessels belonging to the stomach; as you may plainly see, if you take the stomach of a Man, a Dog, or an Hog, (having first tied and cut off the cæliack vessels) and then tying up the orifices, blow it full of wind; for then you may see with a great deal of pleasure the lesser trunks of Veins and Arteries (inserted partly into the top of the stomach and partly into the bottom of it) which being immediately divided into lesser branches, and afterwards into most minute sprouts meet one another, mutually embrace, and being expanded every way, creep all over the stomach, and cover it with a shrubby sort of hair. These Bloud vessels, going inward, and being at last divided into a thousand little sprouts, are terminated in the innermost nervous coat, whose inner surface they dye, as it were, of a Bloud colour, by the thickness of those points, in which the vessels end. And this is plain, if at any time the hairy coat be separated after the dipping of the stomach into boiling water; for then the nervous coat by reason of the extraordinary thick terminations or endings of the vessels will seem to be covered as it were with a small Net of bloud.

Bloud vessels in abundance.

If their use be inquired into; all those who make heat the chief instrument of concoction and digestion in the stomach, may have fewel enough from hence; in that the Bloud boiling up about the bottom and sides of the stomach, as it were a pot, is kept perpetually like a fire, and that lake of Bloud seems to be placed there partly for that end. But yet these bloody vessels have an other office too, which I esteem as necessary as this; and that is, that the Arteries discharge some humour into the stomach,

Their use.

Phar. Rat.
Part I.

The Arteries
bring into the
Stomach a fer-
menting hu-
mour.

The Veins take
in some part of
the Chyle.

The Guts are
either small or
great.

The situation
and dimension
of the small ones.

Three Coats of
the Guts.

How they are
fastned to the
Mesentery.

The innermost Coat
of the small
Guts.

mach, and the veins continually carry thence another sort of moisture, so that there is an immediate and a constant commerce between the chyle and the blood.

But that the food taken in may be not onely concocted, but also dissolved, and that much better by fermentation, so as to be digested to homogeneous chyle, it ought to be impregnated there with a kind of spirituous liquor which is like a Ferment [Rennet or Leaven] (as when Ale Yest or Balm sets other Ale a working) and such an humour or liquor (where plenty of it is necessary) the Arteries onely can supply; which when it is mixed with the reliques of the Chyle that stick in the hairy Veil, doth unquestionless make that juice, commonly called the ferment of the Stomach. Moreover since it is necessary oftentimes that a man should be suddenly refreshed by what he eats, since that cannot be done by the long windings of the Guts and chyliferous vessels, what is more likely than that the Veins which lie very thick and wide open, do receive the more subtil part of the Chyle, and immediately convey it into the blood. You may see very plainly in the first Figure, how these Blood-vessels, being inserted into the bottom and top of the Stomach, cover its whole surface with very thick and numerous branches.

Thirdly, From the Stomach we descend to the Guts, which being of two sorts, either small or thick, I shall not need in this place to give you an account of them all, because both their number and figure is already so well known, not onely to Anatomists, but even to common Butchers. In the former, for as much as concerns the operation of Medicins, we ought to consider, First, their situation and make; Secondly, their Coats; and thirdly their Vessels and Passages. It is their business to receive the Chyle after it is prepared in the stomach, to give it a new fermentation, and to draw from it, when more elaborate and perfect, a nutritive juice into the chyliferous Vessels. In these Guts chiefly do purging Medicins work.


Now though there be but one continued passage of the small Guts, yet by reason of the distinct offices which they bear, there are as it were, three stages in it, and as many distinct names assigned to them, as if they were three several Entrals. In the first of these, the Chyle descending from the *Pylorus*, is presently mixed with new ferments, to wit, the Choler and the Pancreatick or Sweetbread-juice, with which, since the whole mass of it ought by degrees and parcels to be impregnated, therefore every part of it passes this region, to wit, the *Duodenum*, with a speedy motion. In the next place, that is to say, the *Jejunum* [or hungry Gut] the Chyle by being fermented, grows more perfect, is rescued from acidity, and gains a greater volatility [or lightness] but seeing it ought not to stay long here neither, it is presently fermented, and being carried farther, leaves this passage oftentimes empty. Then in the third cavity, the Chyle being volatilized [or lightened] and quite perfected, is plentifully gathered together, and stopped for some time; and whilst the Gut called *Ileon*, being so full of Chyle, is a little compressed by the fleshy fibres, the purer and subtiler part of it, which is to be transmitted into the blood, is squeezed into the milky vessels (and in my opinion, into the Mesaraick veins too) so that at length the remaining fœces or dregs, which are almost quite robbed of all their vertue, are thrust on into the great Guts.

All these small Guts, that is to say, the whole train of them, have the same Coats, and those of the same make too; not much different from the membranes of the stomach, unless in this, that they are somewhat thinner. All the Guts both small and great (except at the beginning and end of them, and some part of the Colon which is fastned to the *Omentum* or Kall) are connected to the rim of the Mesentery, which is as it were exactly round: at which, in the mean time, a man would wonder how they, though they are about six Ells long, could be comprehended by that circumference which is onely one span from its center. But in this case you must observe that the plain [body] of the Mesentery being gathered into many great folds, is in its circumference near three Ells about; and then, that the same circumference, in order to its contracting the length of the Guts, contains, in every hands breadth, about twelve hands breadth of Guts. And as it ought to have been so for many other reasons, so especially for this, that the Guts might not onely lie in a small narrow space, distinctly and without confusion; but likewise that they might move with a slow, successive motion, and as it were creep from one end to the other. For the tendons of the motive or moving fibres, whereby the passages or cavities of the Guts are contracted, are placed in the border or rim of the Mesentery, and from this Entral doth the original instinct of every motion in the Guts proceed; as I shall more clearly shew you by and by: In the mean while let me go on, and discourse of the Coats of the small Guts.

The innermost of them hath a great many wrinkles, that go athwart it; which being also movable, are, as it were, so many lets to the Chyle, and conduce to the moderate retention or staying of it; lest it should flow away too soon to the great Guts.

Guts and the very Excrements, before it is sufficiently perfected or prepared and squeezed out. Those wrinkles are there, as *Fallopins* hath well observed, by reason that this inmost Coat is much longer than the outward one, and so is curled as it were, and wrinkled. For if that be separated from this, and those folds laid open, it will be found to be full thrice as long.

Phar. Rat.
Part I.



Moreover this inner Coat being altogether nervous, and containing in it the mouths of the milky and the bloody vessels, is covered on the inside with such an hairy veil as the Stomach is, and for the same uses, in my opinion: to wit, this covers and defends the mouths of the vessels, receives the first access of the Chyle and all things therein contained, delivering it over by degrees to the nervous coat. But this Coat consisting of all kinds of Fibres, and being the innermost Chamber as it were of the intestinal passage, or way through the Guts, serves very much for sensation, and according to the impressions made upon it, moveth the fleshy coat that is over it, to the performance of expulsive motions, either slow or quick, downward or upward, though it is but seldom. If at any time either the inner surface of this coat is pricked, or stimulated by sharper things than ordinary, or that disagreeable humours fall upon its fibres, great pains and gripes proceed from such pungent causes. Besides, this nervous coat is found to be very obnoxious not onely to distensions [or being stretched out] by wind inclosed in it, but also to expansions [or widenings] and swellings through the violent discharge or explosion of the Spirits that are in its fibres. But besides these nervous fibres, of which so variously interwoven it consists, it is likewise covered all over with very thick and numerous branches of blood-vessels that terminate in it, just as I observed the Stomach was. From whence we may conjecture, that the Arteries, it may be, discharge (and that in most parts) a kind of rejectaneous, or baser moisture into the cavities of the Guts, and that the Mesaraick veins as well as the milky vessels do there receive some part of the Chyle, and carry it more immediately into the blood.

This Coat is nervous and covered with an hairy veil.

There are also a great many blood-vessels in it.

2. The second or middlemost coat of the small Guts is somewhat thicker, and altogether fleshy. There are in it two ranks of moving fibres, the one under the other; of which the first and innermost is annular [or like to rings] and incompassing the whole passage or cavity of the Guts all over with thick rows, is inserted into the rim of the Mesentery, as it were, into a tendon. The other rank of fibres is of strait ones, or such as run out into length; which, being above the others, and cutting them at right angles, go all the length of the Guts; and to them the outmost coat seems to serve instead of tendons, because it being altogether nervous, or as it were, tendinous, is spread over all that row of fibres.

The fleshy or middle coat. In which there are two orders of moving fibres, right and circular.

As to their use; seeing it is the business of the Guts to push forward the Chyle and Excrements from one part to another, and so by degrees still on, till at last they have thrust them quite through their whole passage; and likewise (whilest they themselves are contracted and shortned so, as to be streightned in their cavities) to squeeze and press the more subtle part of the Chyle into the milky vessels and mesaraick veins, it is obvious to conceive, how the aforesaid fibres perform both these offices: for when the circular fibres being contracted successively or in order, diminish the depth of the Guts, and at the same time the long-way fibres being bloated and swollen, make them still more strait and shorter withall, it must of necessity follow, that what is in these Entrals, being pressed behind, must be still pushed forward.

Their use.

But yet you must not think; that the contractions of both these sorts of fibres are so great and continual, as that all that which is in the Guts is moved from one part to another at the same time (though I do believe that in a Purge or Lask it doth sometimes so happen) but that ordinarily, those light and interrupted, though regular and orderly contractions, being often repeated, do as it were, jog the Guts and cause the Chyle with the Excrements to move gently from place to place. But by such jogs of the Guts, and those repeated contractions, the Chyle being continually in motion is rendred more perfect and flows more easily into the vessels, that gape to receive it. Now if it be asked, how or by what means both these sorts of fibres aforesaid, are put upon such a motion, and determined to contract sometimes these, and sometimes those parts in order, I answer, that it is in the Guts as in the Stomach; that is, that in both of them the motions of the fleshy coat depend upon the sense of the nervous one, so that according as this is irritated or provoked, that is, contracted. And therefore whenever any disagreeable object makes a sad impression upon the nervous fibres, immediately, for removing of that, the motive fibres contract the indisposed or affected part of the Guts, that they may ease them of all molestation and trouble.

Their motion proceeds from the irritation of the nervous Coat.

How the nervous fibres come to be irritated.

The nervous fibres are irritated or provoked to motion ordinarily and gently, First, By the reliques of the Chyle, which, when the purer juice is sufficiently strained out, be-

Phar. Rat.
Part I.

become effoete [or without any vertue in them] and troubleſom; for as long as the diſtribution of the Chyle laſts, the moving fibres, being contracted before, will not ſuffer it to glide forth too haſtily, but afterward, by contractions behind, they thruſt it out as a thing of no uſe. Secondly, The nervous fibres are a little too ſharply irritated by the choler and Pancreatick juice iſſuing out of their ſeveral paſſages, and likewiſe by humours that are ſharp and pungent, poured in out of the Arteries; which cauſe greater and more frequent contractions in that part. Thirdly, there is another cauſe of this irritation [or provocation to motion] in theſe fibres, which is yet more vehement and preternatural, and that is from diſagreeable or diſproportionate food, as alſo from Medicins and Poisons, of which Medicins I ſhall ſpeak particularly in the ſucceeding part of this Book.

Befides, the fleſhy and motive fibres of the Guts are ſometimes ſtirred up to ſuch contractions as looſen the Belly through other cauſes more remote. For oftentimes violent paſſions or diſorders of the mind or body bring a Loofneſs or *Diarrhea* upon a Man; that is, when the Spirits that are in the Brain, or other principal parts related to the nervous family, are extraordinarily diſturbed, they forthwith transfer all their own diſorders through the paſſages of the nerves, or nervous ſprouts and branches, to the Spirits that inhabit the Guts, and ſo move them by contraction to thruſt out their Excrements. After irritation, however it be cauſed, there always ſucceed contractions, in that the animal Spirits guſhing violently out of the tendinous rim of the Meſentery into the annular fibres, and likewiſe out of the tendinous fibres of the outmoſt coat into the fleſhy ones that run lengthwiſe, doth ſo bloat and ſwell both ſorts of them, that they thereby render them more contracted and ſhorter. It would be too much beſides my deſign, in this place to ſhew what part the Meſentery bears in the performing of this periltaltick, or expulſive motion of the Guts; for beſides that the tendons of the circular fibres are rooted in the rim of it, you may alſo obſerve, that in the plain of it, the motive fibres go ſtrait from the center to the circumference: of which there can ſcarce be invented any other uſe, than that they being contracted in ſeveral parts, according as occaſion is given, may cauſe the ſame contractions in ſuch and ſuch parts of the Guts.

Of the outmoſt coat of the Guts I need not ſay much, becauſe this coat ariſing from the *Peritonæum*, or inner rim of the Belly, and being ſpread over the former, as likewiſe altogether nervous and very thin, it is commonly taken to be onely a cover to the reſt: but beſides that, I have reaſon to believe, that ſince the ſeveral rows of lengthwiſe fibres are immediately under this coat, and none of their tendons are found any where elſe, this coat is really tendinous, and that the animal Spirits gush out of the nervous fibres thereof, according to the contractions of thoſe fleſhy ones, but return again as ſoon as the motion is over.

The veſſels and paſſages belonging to the ſmall Guts are the conveyances either of Spirits or Humours. Of the former ſort they reckon the Nerves with their plates and branches, all which I have treated of at large in my Book called *Neurologia*, or a Treatiſe of the Nerves. As to the other paſſages, they either carry Humours to the Guts, as the Paſſage of Bile or Choler, the Sweetbread paſſage, the Arteries, and in ſome meaſure the Nerves too (as I have elſewhere ſhewn in a Diſcourſe of the Colick) or they carry and export humours out of the Guts, as the milky veſſels and meſaraick veins. Now every one of theſe Paſſages, with the Spirits and Humours that are in them, and likewiſe ſuch as are contained either in the cavities of the Entrals, or reſide in their nervous or fleſhy fibres, are either the ſubjects or objects of *Pharmacy*, or *Practical Phyſick*, and are uſually firſt and more immediately moved or affected by the operations of all Medicins whatſoever: but after what manner, I ſhall endeavour to ſhew in the particular examination of every ſeveral kind of Medicins.

Of the Bilar and Pancreatick Paſſages, ſince Authors have already ſaid ſo much of them, and yet the truth is not exactly known even to this day, or at leaſt is in diſpute, it will not be pertinent or convenient for me to raiſe an argument in this place, which muſt of neceſſity be very prolix and intricate, or tedious and entangled. How Vomits and Purges work upon theſe parts, I ſhall ſhew hereafter.

As for the Bloud-veſſels, it is a common obſervation, that a vaſt number of Arteries and Veins are ſpread into branches all over the Meſentery, and that from thence there is an infinite company of ſprouts diſtributed to all the Guts. Of which I have likewiſe taken notice, that being inſerted into the outmoſt coat, they beſtow but few of their ſprouts upon that coat, but that almoſt all their greater branches, going ſtrait into the Guts come back into the inner coat, in which they are terminated, and ſend forth an extraordinary quantity of ſmall ſprouts, which cover the ſurface of it.

Now

How Contractions ſucceed irritation.

The outmoſt Coat of the Guts.

The Veſſels and Paſſages belonging to the Guts.

A great many Bloud-Veſſels in the Guts.

Now upon this consideration a man would wonder, why so much blood should be designed to flow into these Entrals, that of themselves are almost bloodless. It is not likely that the onely reason of it is to supply heat and nourishment, since the muscles and outward coats of the Guts, which have need of greater plenty of such vessels, are yet content with a less number. The famous *Mabius* (to untie this knot) affirms, *That Nature hath placed so many Arteries in the Guts, that in an Embryo, the Excrements of the Mothers Blood wherewith at that time it is nourished, might be discharged into the intestines.* And he gives the reason of it, which is, *Because the Guts of an Embryo or Infant new-born, contain in them a blackish excrement.* But indeed this argument is easily answered, if we grant (as we ought to do) with *Harvey* and other Neotericks or Modern Physicians, that an Embryo in his Mothers womb does suck and receive a nutritive liquor at his mouth. And yet my opinion is rather, that those Arteries in adult Animals do often times purge forth the grosser parts of the blood (which by sweat, and other ways, are unapt to pass) through the Guts as through a Sink. But that in the mean time the Veins do receive some part of the Chyle, and having presently reduced it, mix it with the Blood.

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The reason of it.

Concerning the great Guts, in relation to the practice of Physick, I shall not need to say much in this place, because the virtue of Medicins taken in at the mouth is almost quite spent before it comes to those Entrals; in so much that the irritation or cause of motion in them, arises partly from consent with the upper Guts, and partly from the violent expulsion of what is in them, rather than from the Medicin it self. They have the same coats as the small ones; and seeing that in the Colon the excrements ascend strait upward, there is a necessity for stronger fleshy fibres to make the motion of contraction the more forcible. For which reason, if there happen an inflammation or imposthume (as I have often known it hath) about the beginning of the Colon, so that the fleshy fibres being hurt, cannot perform their contractions to raise their excrements upward, the excrements stop, and lie toward the *Ileon*, which causes the *Iliack* passion, beyond all cure. Moreover in this Gut there are likewise framed those arched cavities or chambers, as it were to the end, that the excrements being thereby longer kept in, the trouble of going too often to stool might be prevented. The Physick that belongs to this part consists principally in Clysters. But in some People the inner coat of the Colon is so very tender and sensible, that if you give them but a gentle Clyster, the spirits are presently in a combustion, and being exploded or discharged within the nervous fibres, blow up and stretch the membranes to the utmost degree, and thereby create very great pains in the whole Belly. What I have said just now concerning the expulsive motions of the Entrals that depend upon the contractions of the fleshy fibres, will more plainly appear, if you consult my Hypothesis, not long ago published, concerning the frame and motion of a muscle. All that is more to be done, I have taken care, for the better illustration of the Anatomy of these parts, to get the Figures of them exactly delineated by a very skilful Artist and placed here hard by; and though in the description of the Stomach, with the Weazon and Guts, I have followed *Fallopium* and other Ancient as well as Modern Anatomists, who assigned them onely three coats; yet if you separate these coats somewhat more carefully than ordinary (after they are dipped in boyling Water) there will appear four very distinctly. For the hairy covering, which is esteemed onely as an excrescence of the nervous coat, is a pretty thick and peculiar membrane of it self, and by reason of those numerous glands which are upon its outward surface, may properly be stiled the glandulous coat, as it manifestly appears by the Figures.

Of the great Guts.

The Explications of the Figures:

The first Table represents a Mans Stomach taken out and blown up, with the Vessels full of Blood; so that all the Arteries and Veins, with their branches (which are truly and exactly delineated) may be plainly seen.

A The Weazon.

B The mouth of the Stomach, where the moving fibres of the Weazon, which are oblique upward, become strait by reason of the sudden shutting and opening thereof.

C The orifice of the Pylorus, with the Duodenum joined to it.

D D Part of the Duodenum, whose fleshy fibres do there appear thicker under the outmost Coat.

F F to C The Antrum Pylori, or Hollow of the Pylorus.

G G The top of the Stomach, where the Blood-Vessels are inserted and descending, scatter their Branches and Sprouts every way.

H H H

Phar. Rat.
Part. I.

- H H H The bottom of the Stomach, into which the Bloud-Vessels being inserted, do in their ascent, disperse thick numerous branches and sprouts to every part of it.
I I I The mutual inosculation and wonderful communications between the Vessels of each insertion.
K L The right and left end of the Stomach.

The second Table expresses the outmost coat of a Mans Stomach, which is altogether nervous; whose nervous fibres running out the whole length of it, cut the outward fleshy ones that are under them almost at right angles.

- A The Weazon, in whose outward Coat all the nervous fibres go strait downward, and cross the fleshy ones that are under them obliquely.
B The mouth of the Stomach.
C The Pylorus with its Antrum or Hollow, D, and part of the Duodenum joined to it, E.
F The top of the Stomach, where the Bloud-Vessels appear in very great numbers.
G G G The nervous small fibres that go all along the Stomach from one orifice to the other and on both sides.

The third Table shews the Stomach of a Man stript of its outmost nervous tunick or coat, that the outward or convex surface of its middlemost coat, together with the fleshy fibres thereof, may appear.

- A The mouth of the Stomach, into which the Weazon a a a is inserted; which also the circular fleshy fibres b b b encompass, and, upon occasion, being contracted, close or shut up.
B The Pylorus with the Duodenum joined to it.
C The orifice and cave or hollow of the Pylorus, both which are freighted by circular fibres (whilest they are contracted) and thereby (I suppose) shut up or closed.
D D D The circular fibres that encompass the whole Body of the Stomach in depth.
E E E The top of the Stomach, where those fibres arise, and being contracted, draw the whole frame of the Stomach, which they very much freighten, toward it.

The fourth Table; whose first Figure shews the whole Stomach, with the inner, concave surface, changed into the outward and convex, that the hairy veil or covering, with those wrinkles and folds that go all over the Stomach, may come in view.

- A The left orifice, or mouth of the Stomach.
B The Cave or Hollow of the Pylorus, in which the coats are thicker than ordinary.
C Its orifice, by which it is fastned to the Duodenum.
D D The top of the Stomach between the two orifices.
E E E E The sides, ends, and bottom of it, in which the hairy veil of the inner Coat, and therein the wrinkles and folds, or furrows, are lively expressed.

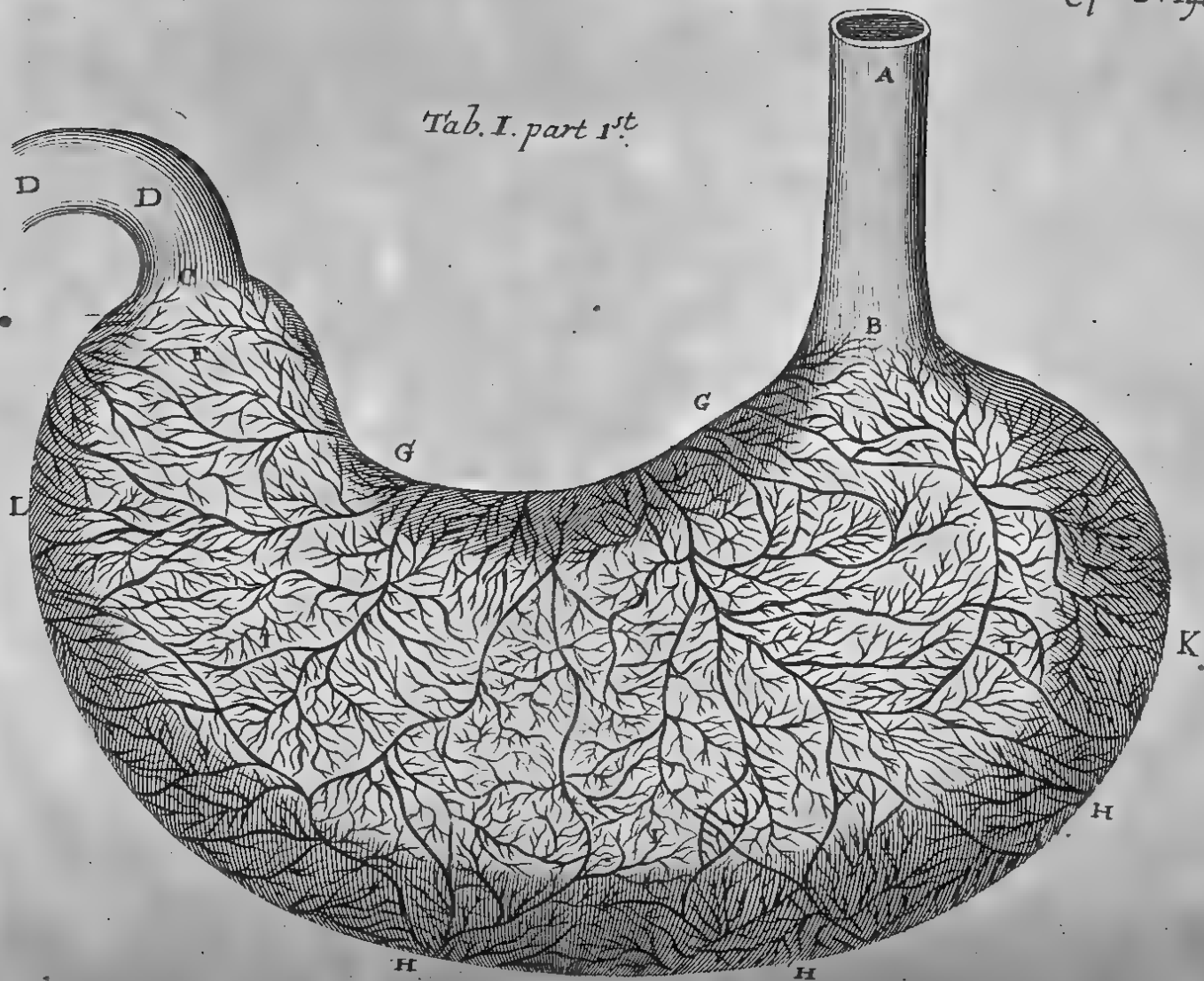
Figure II. represents a part of the Nervous Coat, in which, the hairy covering being taken off, the inner or concave surface, together with a thick and numerous company of branches of Vessels doth appear.

Figure III. Shews a part of the hairy or glandulous coat, in which the outward surface, whereby it is connected to the Nervous Coat, is apparently very full of glandules and mouths or orifices of vessels.

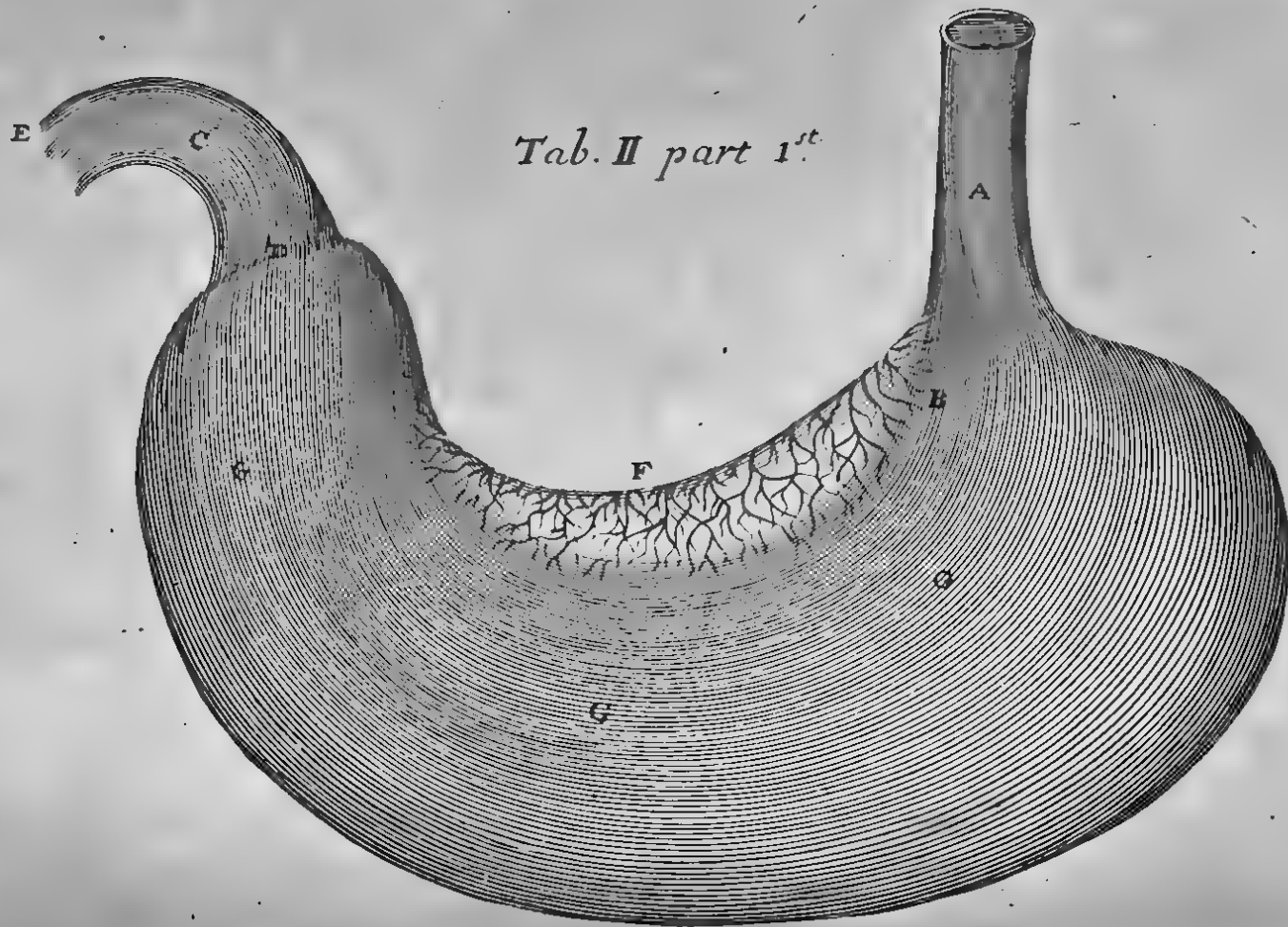
The fifth Table shews the inner and concave surface of the fleshy coat, turned with the wrong side outward, that the other row of moving fibres may come in view.

- A The mouth of the Stomach, near which the row of fibres seems to arise, and is carried forward, partly in right lines, and partly in oblique ones.
B B B A notable company of fibres, which encompassing the mouth of the Stomach, above the neck or top of it, go toward the Pylorus, and covering the cave or hollow of it all along, are terminated in the orifice.
D The orifice of the Pylorus.
E The Cave, Den, or Hollow of the Pylorus.
F F F F Other fleshy fibres, that running obliquely from the left side of the Stomach to the right, descend to the bottom of it. The

Tab. I. part 1st



Tab. II part 1st



Tab. III. part 1st

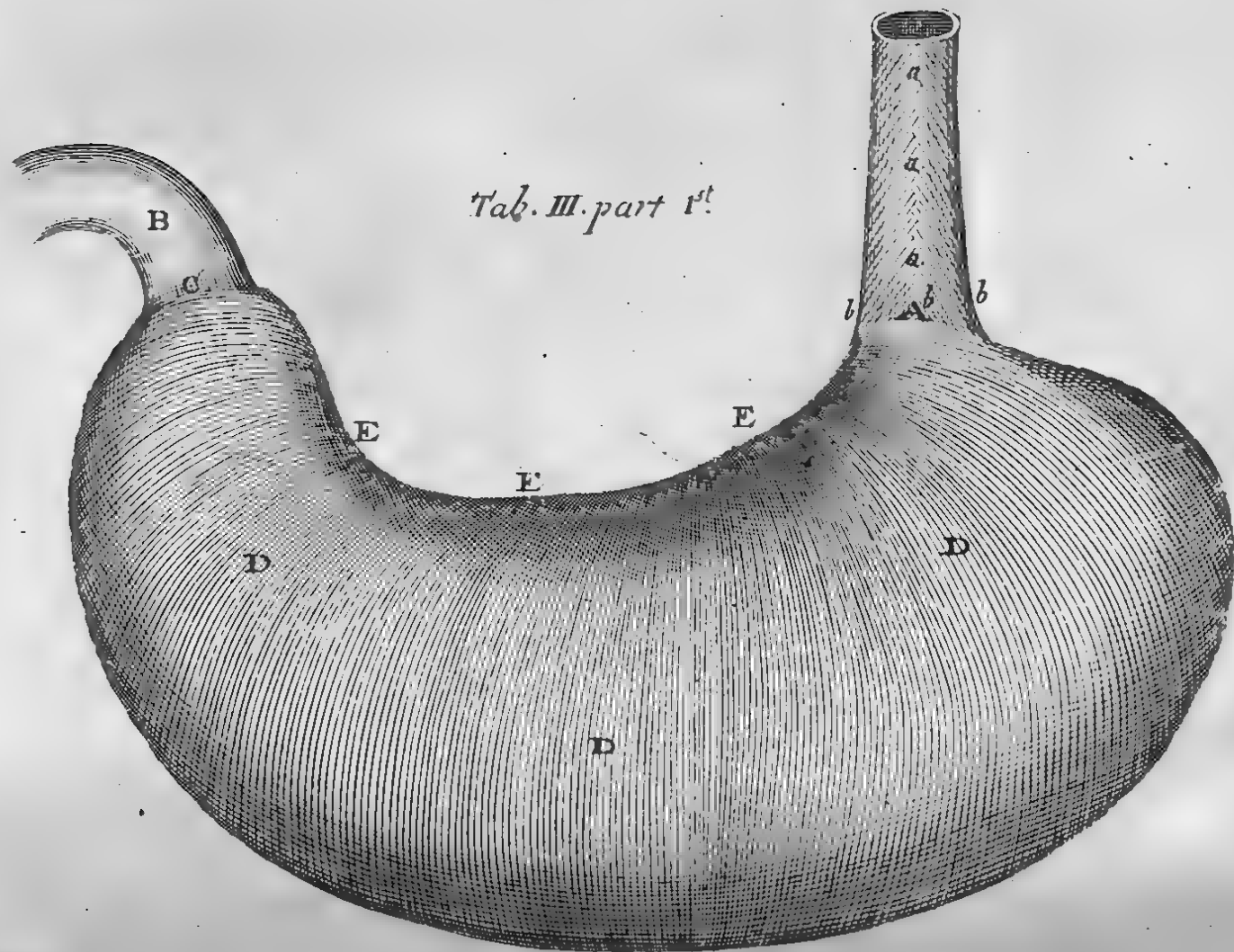


Fig. 2.

Tab. IV. part 1^{re}

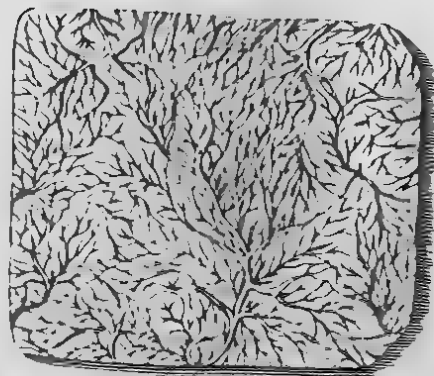
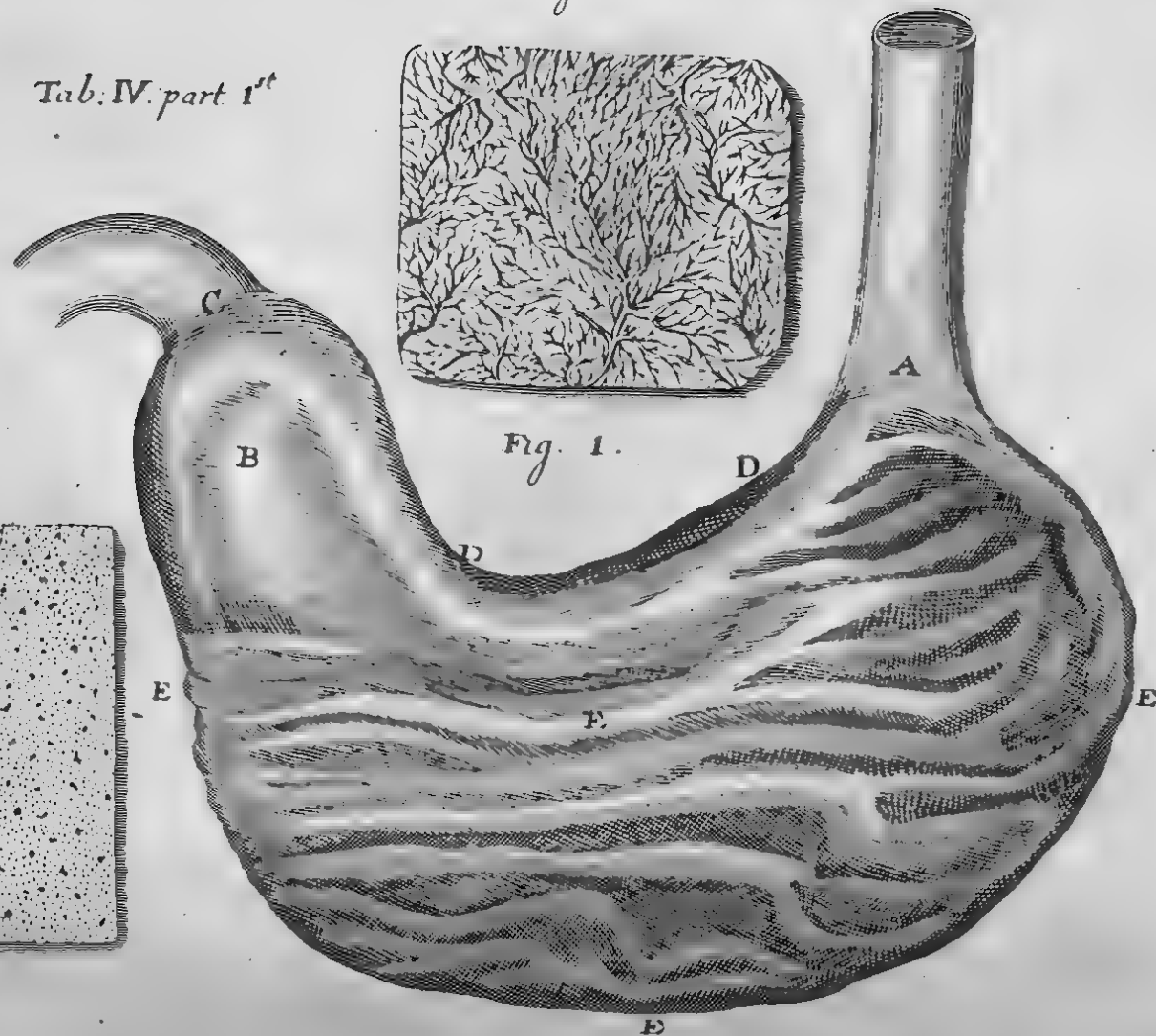
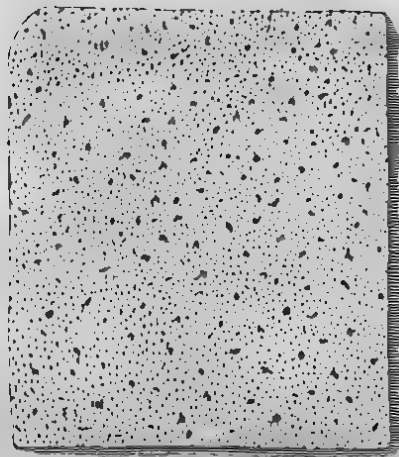
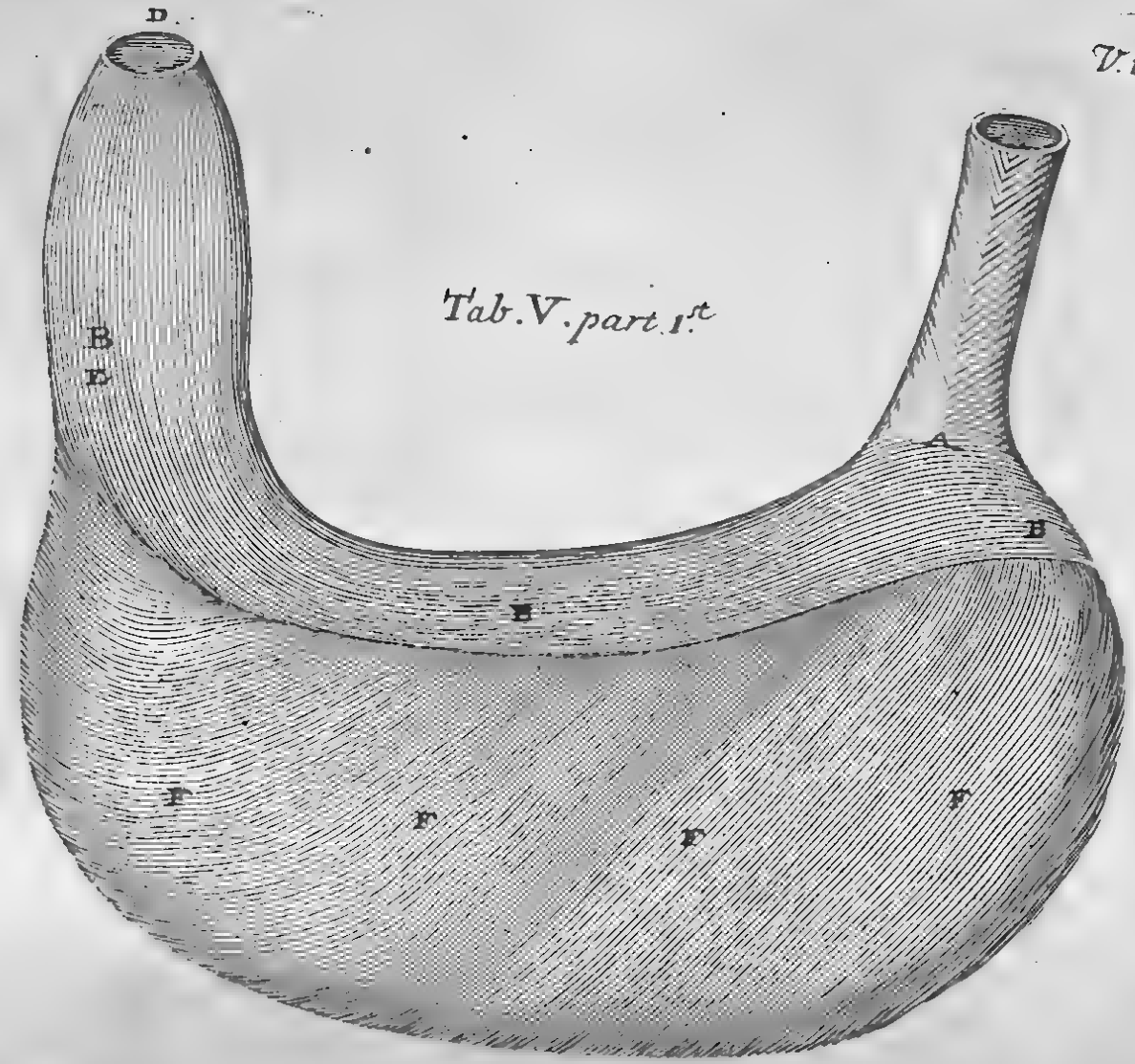


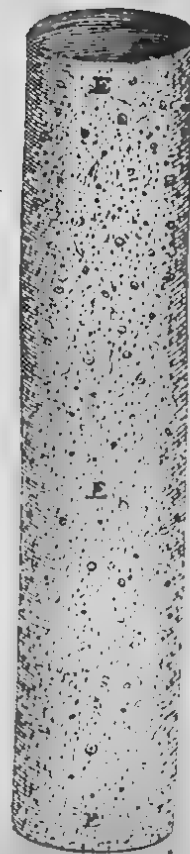
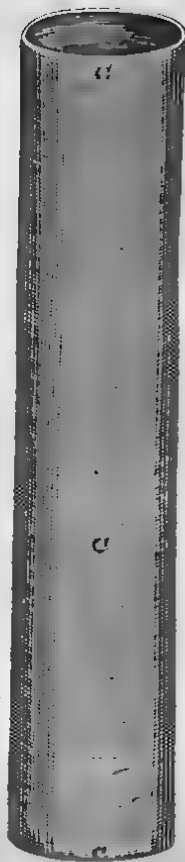
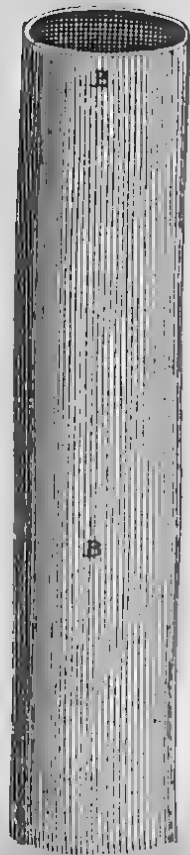
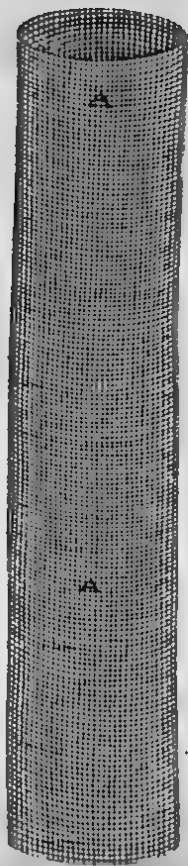
Fig. 1.

Fig. 3.





Tab.V. part. 1^{re}



The sixth Table represents all the Coats of the small Guts separated from each other, so that the nervous fibres, with the glandules and branches of Vessels, as also the ranks of moving fibres may clearly and distinctly be observed.

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Part. I.

- A A Shews the outmost surface of the whole Gut, whose nervous coat appears to be very thin, with its nervous fibres, which are extraordinary small and round.
- B B The outward surface of the middlemost or fleshy Coat, which, when the other is taken off, appears very plainly with its row, or rank of moving fibres, that ran lengthwise.
- C C C The circular or annular fibres of the same Coat, which, when the former row or rank is taken off, most plainly appear.
- D D D The inner, nervous Coat, whose inner surface, when the hairy veil is taken away, comes into view, with thick and numerous branches of Vessels.
- E E E The outward or convex surface of the hairy or glandulous Coat, which sticks to the nervous Coat, and is full of glandules and little mouths of Vessels.

S E C T. II.

CHAP. I.

Of Vomiting and Medicins that give Vomits.

HAVING thus marked out, as it were, the Place of Medicinal action, or at least lightly shadowed forth the first Scene thereof, my next business is to give you an account of the several kinds of Medicinal Operations, together with the Reasons of them, and the manner how they work upon, or affect the parts: First therefore let us inquire, what is done in the first stage, to wit, in the Stomach, and how Vomits work there. Where in the first place it will be necessary to explain what Vomiting is, as likewise from what causes, and upon what occasion, whether naturally or preternaturally, it usually happens. And then in the second place, I shall shew upon what Parts, Spirits, or Humours, and how Medicins operate whilest they provoke us to vomit.

As to the first, if at any time any person be set on vomiting, he feels within himself the bottom of his Stomach drawn upward, and the upper orifice opened (whilest the Pylorus in the mean time is very probably shut, or drawn inward) and that the whole passage of the Weazon at the same time strains to make a spiral winding kind of motion upward, to the end that what is within, being by degrees pushed higher, may at length be discharged through the mouth. Which motion of those parts is questionless performed by the fleshy fibres that compose the middlemost coat of the Stomach. For I have observed, that there are in this two distinct ranks of fleshy or moving fibres, which encompass the Stomach in all its dimensions, and being contracted at the same time, gather up the bottom and the sides thereof, draw it upward, and bend it toward this or that orifice, that what is contained in it may be cast forth through one or the other door. As for the inner fibres, that determine the contractions of all the rest to this or that evacuation, if, through a small irritation made any where about the bottom or sides of the Stomach, the motion begins near the Pylorus, and the inward moving fibres are first and more strongly contracted at their right ends, then the whole frame of the Stomach being drawn that way, pours out its load into the Guts; but if the irritation being vehement and very provoking, be caused in any part of the Stomach, and cannot easily be allayed or transferred toward the Guts, the motion beginning near the left ends of the inner fibres, and drawing towards the mouth of the Stomach, makes all the body of the Stomach, which is extremely streightned and contracted, lean that way: in so much that the Pylorus being drawn inward, or shut up, and the mouth of the Stomach open, all things therein contained are thrown out, by way of Vomit. Now the same fleshy fibres (according as the animal Spirits being variously provoked, do first gush out of the several tendons into their right or left ends, and there begin the motion) are respectively determined to purging or vomiting. Moreover, when the Stomach is disposed to throw a thing upward in man-

How the Stomach and weazon are affected in vomiting.

what fibres perform the business of Vomiting.

ner

Plar. R. at.
Part. I.

ner aforesaid, the Weazon too conspires in the action, and strives to get it out. For seeing we have observed that there are two double ranks of motive fibres in the fleshy coat of it, whereof the one part ascending obliquely, and the other descending after the same manner, cross one another, it seems to be the office of the former, being orderly contracted whilst the Party strains to vomit, still to shut the Weazon behind the matter that is to be thrown out, and so by degrees to push it into the cavity of the mouth.

Vomiting a
Convulsion.

Vomiting therefore, being a violent, and oftentimes an involuntary motion of the Stomach, may very well be called a kind of Convulsion: which I also affirm to proceed from the explosion [discharge] or a great expansion [or broadning] of the animal Spirits that possess or inhabit those fibres, according to our account of Spasms or Contractions and Convulsions elsewhere laid down. For those Spirits being extremely irritated or disturbed, and upon that account growing presently very vehement and springy, they rush impetuously out of the tendons that lie near the left orifice, and afterward immediately out of others into the fleshy fibres, which they extraordinarily blow up and shorten, in so much that all the parts of that coat are brought nearer to each other, the whole cavity of the Stomach being streightned, folded together, and consequently contracted toward the left orifice, drives all that is in it upward, in order to its being discharged by Vomit.

How Vomiting
differs from o-
ther Spasms.

In most other kinds of Spasms the convulsive motion is wont to proceed the same way as the natural: But Vomiting seems to be quite contrary, or at least opposite to the ordinary and natural action of the Stomach. For the usual and almost constant gesture or motion of that, is to be contracted either wholly or in some parts, downward or toward the Pylorus: for such a motion or tendency it wants, not onely to swallow meats, but that they may descend into the bottom of the Stomach, and there being more streightly compressed, be rolled from side to side, digested into Chyle, and after that transmitted to the Guts. Wherefore for these uses the moving fibres of both ranks, being blown up by the kind incursions of the Spirits, put the Stomach into such a posture as the instinct of Nature requires and suggests.

Again, If any irritation happen in the nervous fibres of the Stomach as long as the offence is slight and easily removed, the expulsive contraction works toward the Pylorus rather than the Weazon; but in Vomiting, the contraction of the motive fibres beginning from their other, that is, their left ends, and growing immediately more violent and impetuous, forces the whole cavity of the Stomach, being gathered up together, and much streightned, to bend toward the left orifice, and empty it self that way. The reason of which is, because if there be any thing in the Stomach that is very disagreeable and repugnant to Nature, it ought not to be carried the ordinary way through the long circuit of the Guts, and so at last be voided at the Fundament, but to be rejected by a nearer passage, and immediately be thrown out, lest by remaining there it should cause in the Body some incurable disaster. Besides, when any great mischief befalls other parts remote from the Stomach, it oftentimes so happens, that People Vomit by consent [of the parts] for the greater security of the Stomach, lest whilst Nature is employed about those other parts, the Stomach (in which is the original nourishment and fewel of life) should receive any thing that is hurtful. So well it is contrived by the providence of the Divine Creator, that for the greater security of Mans Body as of some Castle, as often as a foreign Enemy comes upon it, or that its own Natives raise Civil Wars, immediately all Strangers are turned out of the very Avenews, to wit the Stomach, as Persons suspected.

The immediate
cause of Vomiting.

Now therefore the principal and immediate cause of Vomiting is, the sudden and vehement explosion or discharge of the Animal Spirits that are in the fleshy coat of the Stomach; by which they being very much irritated or stirred, and consequently expanded [or widened] and rarified, and gushing impetuously out of all the tendinous fibres, but first and chiefly out of them, that are planted near the mouth of the Stomach into the fleshy ones, do so on a sudden inflate or blow up and shorten them, that the sides and bottom of the Stomach being drawn nearer to each other, and at the same time raised toward the left orifice, throw out what is therein contained into the passage of the Weazon, through which (since that is likewise presently contracted all along from the bottom to the top) they are carried off at the Mouth.

How the Spi-
rits are moved
in Vomiting.

These Spirits are so exploded or discharged in Vomiting, because they are extremely irritated or provoked: which how it comes to pass, I have shewn in my Treatise of Convulsions: to wit, that they, being of a very elastical or springy nature, when any thing disturbs them, yea sometimes of their own accord, and by reason that what should be their couple to keep them together is of a different nature, break forth, and hurry themselves impetuously toward all parts. But upon what account, and how it hap-

pens that they are so provoked, we shall enquire by and by. In the meantime we may observe, that the Spirits which reside in the fibres of the Stomach are in some people either thicker or stronger, so that they are not moved to such emetick explosions or discharges by Vomit, unless the irritation or provocation be very great and strong: but in others they are more subtle, *i. e.* slender, or elastical and springy, so as to be easily incited to vomitive Spasms or Contractions. So also we may take notice, that when the provocation is given to the fleshy fibres of the Stomach, the contraction that is caused in them, tends more readily toward the Pylorus, but in others, toward the mouth of the Stomach; and consequently it is accordingly attended with Vomiting or Purging.

Phar. Rat.
Part I.

Wherefore, as to the more remote causes of Vomiting, I am of opinion, that they are all such things as do extraordinarily irritate or provoke the Spirits, which are in the fleshy fibres of the Stomach: which being performed after several manners, I shall reduce them to some certain Heads. And first, All unproportionate objects that affect the other inner and nervous coat of the Stomach, or rather the Spirits that reside in it, are to be looked upon as conducing thereunto; for that coat being vellicated; or twitched by them, doth oftentimes move the other which lies over it to vomitive contractions. Now those provocatives are either taken in at the mouth, that is, they are either disagreeable Food, Medicins, Poisons, or other matter generated in the Stomach; or lastly, are brought thither from remote parts by the Arteries and Nerves: or else secondly, the Spirits that reside in the fleshy fibres of the Stomach are irritated or stirred up by some disturbance given to other Spirits that are here and there dispersed at a distance, and do communicate their grievance to the Stomach by the passages of the Fibres or Nerves. Vomiting which is excited by the former of these two causes, is said to be a proper indisposition of the Stomach, but this latter happens by consent. Of all which I will give you some instances.

The more remote causes of Vomiting.

First therefore an irritation or provocation in the inner coat of the Stomach, causes Vomiting sooner than any thing else: For this part being nervous and very sensible, receives impressions from all those things that are contained in the Stomach; and accordingly, as those are pleasant or unpleasant, the fleshy coat that is above it, is excited to keep in, or throw out what is within; and as to these two last motions [of retaining or expelling] we either Purge or Vomit, according as the unproportionate object is more or less injurious to Nature. Moreover, in this coat of the Stomach there seems to be a kind of peculiar Sensory, or Organ of perception, either of Touching or Tasting, distinct from any other in the whole Body: For though some sorts of Medicins or Food, as *Stribium*, *Mercurius vitæ*, *Flower of Antimony*, and *Barbels eggs*, with many other things, when they are chewed in our mouths, do not offend the Sense at all, yet the same things when swallowed down into the Stomach, do violently irritate or provoke this coat, and in a short time cause very grievous contractions, or convulsions. So if any one even unawares swallows down a bit of meat that he hath an Antipathy against, though it be never so small, and covered with other meats, as it were with a Visor, yet the Stomach knows it, and turns it presently out, like an Enemy that had got in by stealth. The Provocatives to Vomiting that are taken in at the mouth, are either Medicins whose manner of working shall be demonstrated by and by; or they are Poisons, which produce that effect, in as much as they upon their first contact or touch, being of a very destructive Nature, astound the Spirits of the Stomach, and make them as it were mad. Or Thirdly Food, concerning which it is commonly known, that if they offend us either in their manifest or hidden quality, or in their quantity, or manner of being taken, they become unproportionate to the Stomach, and consequently very often cause Vomiting.

The chief cause of Vomiting. An Organ of Sense in the Stomach.

The Provocatives to Vomiting are either taken in at the mouth.

Secondly, The matter that causes Vomiting is sometimes generated in the Stomach, that is, though there be no fault in the Food, when taken in, yet sometimes the chyle, or the fermenting juice of the Stomach, degenerates into an acid, lower, or bitter humour, or such as is otherwise irksome, and consequently provoking; as it very usually happens in cholerick and hypocondriacal persons.

Or generated in the Stomach.

Thirdly, Nor is the provoking Humor less frequently sent into the Stomach from some other part: for besides that the Gall, and (as some think) the Pancreatick or Sweet-bread juice sometimes severally, sometimes together (whilst they mutually boyl and are discharged into the Stomach) excite the fibres to vomitive contractions; and that likewise other heterogeneous matter, which is brought hither by the Arteries, causes oftentimes extraordinary Vomitings: so in the fits and crisis of Fevers, but especially in the Plague and Small Pox it very often happens. Sometimes the mass of Bloud when it swells so that it cannot expel or throw off its grosser part by perspiration, it carries it into the cavities or hollows of the Stomach and Guts by the branches of the *Arteria Cœlica*; so that

Or is sent from some other parts.

Phar. Rat.

Part I.

The Vomitive
matter comes
through the
Nerves too.

that the coats of those parts being mightily vellicated or twinged, undergo horrid Vomings, and even Dysenteries too at the same time. Nor doth the Vomitive matter seem to descend onely through the Arteries, but some times through the Nerves too. And from hence I have plainly shewn the Colick very often to arise: Yea in many People (that have been subject to Convulsions) I have observed, that after an Head-ach, with drowziness and swimming in the Brain, they have been disposed to vomit: in so much that every day they would throw up all they had eaten without any signal uncleanness in their Stomachs. Now the matter being thus brought in by the Arteries or Nerves upon the coat of the Stomach, if it be fluid and easily dispersed, is presently shook off again, and the Fit is soon over; but if it be more fixed, and sticks to them more stiffly, or (as it some times will) grows into Tumours or Risings of several kinds, it causes a disposition to Vomit, which stays long by one, and is not easily cured.

Vomiting by
sympathy or
consent.

So much for that kind of Vomiting, whose material or provoking cause, being planted somewhere about the inward surface of the Stomach, and affecting the nervous fibres with meer touching of them, doth excite the Spirits which reside in the fleshy fibres, to violent explosions, or discharges, by way of Vomit. But there are other kinds of Vomittings, in which the first provocation is in other places, and the Stomach is immediately moved to contract it self by consent. For since there is such an alliance and mutual dependence between this Entrail and many other parts, it often happens, that when any animal Spirits are any where very much disturbed, immediately other Spirits that are inhabitants in the Stomach, are likewise moved, either by the continuity or connection of the fibres and nerves, and so are put upon vomitive explosions, or violent discharges by way of Vomit.

By consent of
what parts.

The places of this sympathetical Vomiting, are either nearer; to wit, the two orifices of the Stomach, with the Duodenum and the Weazon; or more remote, to wit, the Brain and the membranes thereof, as also the Spleen, Reins, Ureters, Mesentery, Womb, and perhaps other Entrails in the lower Belly: in one or more of which, if a contractive motion be begun, and from thence communicated to the Stomach through the Nerves, it excites the fleshy fibres thereof to cause a Vomit. So likewise in the Head, when the animal Spirits are much disturbed, their disorder presently affects others that are in the Stomach, by consent, and raises them into the like tumults. I will lay down instances of every one of these sorts, together with their causes.

First from both
orifices of the
Stomach.

First of all both the orifices or doors of the Stomach, since they are very sensible by reason of those manifold insertions of Nerves, are easily provoked; and consequently, being drawn sometime inward, sometimes outward, and variously expanded [or widened] and shut, they cause expulsive motions, either upward or downward, in the whole Stomach. There is hardly any man but may feel in himself certain acid or bitter Humours floating in his Stomach, and that by biting the left orifice, they cause queaziness, or vomiting; and so doth the Gall too, when it rejoines into the Pylorus.

From the Pylorus.

It would be too impertinent to tell you *Helmonts* Dreams concerning the dignity and dominion of these parts: where he makes the left orifice to be the Seat of the Soul: and the right, to wit, the Pylorus, that of the Appetite, as also the Shop or Workhouse from whence some other actions or passions purely natural have their original; and so likewise that from the indignation (as it were) and obstinate shutting up of this part, horrid vomittings proceed. Although I do not at all agree to what he says, yet the following Stories will shew you, that if these doors are too fast bolted or barred, it will occasion Vomiting, and other evil dispositions of the Stomach.

Instance in a
particular case.

A young Gentleman that had been long out of order, was troubled first with frequent Vomiting, and afterward every day for several moneths, in so much that it was almost continually upon him, till at length being quite spent with it, he died. I therefore opened the Body and found the Pylorus encompassed round about with very tender and sensible small bumps or swellings, that did almost shut its mouth quite up; in so much that the Chyle which was got into the little distances between the nodes or knots, did putrifie extremely, and the whole Entrail in a manner was in very great pain, and troubled with a continual Spasm, or Convulsion. So likewise it is very plain from that extraordinary case of an *Oxford* Man, that the shutting up of the left orifice causes in a manner continual vomiting. There was a very strong person, and a man that was otherwise sound enough, who had for a long time been troubled with frequent vomiting, and used to bring up what he had eaten oftentimes, though not always, as soon as it was got into him: At last when all remedies had been tried and found of no use, the distemper came to such an height that he would eat very hun-

Vomiting from
the shutting of
the left orifice
of the Stomach.
A notable case.

gryly

g yly, till such time as his Weazon was top full up to his throat, and then presently Phar. Rat.
 throw all that he had swallowed up again crude and unconcocted as it went in, so that Part I.
 nothing at all went into his Stomach; now therefore since Medicins [Phylick] did him no good, but that he was ready to faint for hunger, and in danger of dying every day, I got him an instrument, like a small rod, made of Whalebone, with a Button or Knob of Spunge fastened to the end of it: which instrument the distempered person putting into his throat and weazon immediately after he had eaten and drank, he opened the mouth of the Stomach and thrust the meat (which otherwise would have staid by the way) down into it; and thus did he sustain himself for 16 years, using the same Engine to this day, and being still alive and in health, though without that instrument he would certainly die for want of nourishment. Without question in this case the mouth of the Stomach being always shut, either by a Tumour or a Palsie, admits nothing into it, unless it be violently opened.

2. As often also doth a Spasm or Convulsion which is once begun, and by the continuity of the fibres promoted into the stomach, cause contractive motions to vomit, by reason of the provocatives that are hard by above this left orifice, and below the Pylorus. When the meat, as it goes down, sticks in the Weazon by reason of a Palsie, or some obstruction there, and consequently stimulates or pricks the nervous fibres, immediately the fleshy ones, being drawn upward, make the stomach also consent in the motion. The like effect is often produced by the irritation or provoking of the palate or uvula. And hence it is that meat or drink which is ungrateful, even as soon as it is in our mouths, or a Fether put down the throat, causes vomiting, or very often straining to vomit. For the same reason in a Pthifick, a violent fit of coughing is accompanied, or attended with vomiting: to wit, through the vellication [or plucking] or concussion of the same coat, that covers both the Weazon and the top of the Wind-pipe too: So likewise in the lower appurtenances of the stomach, to wit, the Guts, if any pain and convulsion happens in those parts, it often causes vomiting through the continuity of the fibres by which it creeps into the stomach. For this reason in the cholerick Distemper, the Iliack Passion, or Twisting of the Guts, and other torments of the Bowels, people often vomit. And hence also some men that have Guts more tender than ordinary, do constantly vomit when they take a Clyster. It were easie to heap together upon this occasion many more instances of this kind, but let us pass to other causes of vomiting.

3. Besides these that I have just now cited (in which the provocation begins either in the Stomach it self or the appendages of it) it sometimes happens that the Stomach, though it be in it self sound enough, and free from any fault, suffers for the misdeemeanours of other parts a great way distant from it; which is not brought to pass by the continuity of the fibres, but by the intercourse or commerce of the nerves. For through them, when the animal Spirits in one place are disturbed, others that reside afar off, conceive the like disorder, and suffer convulsions: whence it is, that if a man receives any great wound or blow upon the Head, it often causes him to vomit, because the Spirits within the Brain, being disturbed, excite the others that inhabit the Stomach into the same commotion, by the commerce or intercourse of the eighth pair of Nerves: for the same reason some that go in a Boat or a Coach are apt to vomit extremely; of which the cause is not (as some say) an agitation or joling of the humours, but indeed the animal Spirits which are in the Brain, being forced into irregular motions, do throng into the mouths of the nerves, and through them cause contractive motions to vomit. In the mean time the matter that is thrown off by vomiting, is meer choler, which is drawn forth from the Vessels designed for the reception of it, by a spasm or convulsion formerly caused in them; so far it is from being the primary or chief cause of vomiting. Moreover if at any time the sprouts and lower branches that grow out of the trunk of that same eighth pair, and are distributed into peculiar Entrals of the Abdomen or lower Belly, are provoked to convulsions, other sprouts very often, though untouched, undergo such irregularities, and do also communicate convulsive motions to other Entrals, but especially to the Stomach. This is evident from that vomiting, which frequently happens in Fits of the Stone in the Kidneys, the Colick and Fits of the Mother.

Hitherto of Vomiting in general, together with its subject, nature, causes, and various productions; in which I have plainly shewn that this effect is produced altogether by the Spirits, which inhabiting the fleshy coat of the Stomach, are extraordinarily provoked and forced into convulsive explosions or discharges; but that those Spirits are for the most part and chiefly moved to such contractions by the painful impression that is made upon the inner nervous coat. And yet farther, I have also shewn that those Spirits which cause vomiting are disturbed by the disorders of other

The cause of Sympathical Vomiting.

Vomiting caused by intercourse of the Nerves.

In the Head.

In the lower Belly.

Phar. Rat.
Part-I.

How Vomits
work.

Spirits in some distant parts, which either by the continuity of the fibres, or the passages of the nerves communicate their troubles to the Stomach. These things therefore being thus premised, it remains in the next place (what I proposed to do in the second place) that I treat of Vomiting Medicins, and demonstrate how, and with what difference they work upon the Stomach and other parts of the Body.

For the performing of this, it is obvious to conceive, that Vomits taken in at the mouth and received into the Stomach, do first irritate or provoke its inner coat, which is altogether nervous, and put it to some pain; then that by the instigation of this nervous coat the fleshy one that is over it, is also affected or moved and excited to contract it self and throw out that troublesome matter which is within. But in the doing of this, there are some differences both in the modes of irritation, and ways of evacuation, the reasons of which do not easily appear.

For first, since purging Medicins, being swallowed into the Stomach, provoke the fleshy fibres thereof to expulsive contractions, whence comes it that some of them should more frequently and rather incline to vomiting, and the rest onely to purging, and not indifferently to either?

Secondly, Among those things that commonly, and almost constantly cause vomiting, you may observe, that some of them produce that effect by a way of working that is very manifest; as when that we take is altogether ungrateful to us in Taste, Smell, or any other sensible quality; or that it offends in quantity; and likewise that there are other Medicins which are more properly and specifically reckoned Vomits, whose Vomiting virtue or power, though altogether hidden from our senses, shews it self by effects which are produced in the Stomach. The solutions or rational accounts of all which do much contribute to the right understanding of Vomits, and the operation of them.

1. As to the first, All Medicins that you would have to work by Vomit rather than by Stool, ought to consist of such particles, as being irksome, or at least disagreeable to Nature, may likewise be of such a quality or quantity, that they cannot be either totally overpowered by the stomach, or so long endured by it, till they may be by degrees wiped off from the fibres or hairy veil thereof, and carried out of the Pylorus with other juices by little and little. Now if those kind of particles do either vellicate or twinge the fibres of the stomach too violently, or stick to it too fast, or disturb and stretch it with their motion, immediately the fleshy fibres are ready for an expulsion, and then by instinct of Nature they are the rather contracted in such a manner, as that they may throw off what is offensive with the greater force and the nearest way. How the fleshy fibres are moved in the business of Purging, I shall hereafter tell you in its due place.

As to the distinction of Vomits, and the several ways or reasons of their working; since they are commonly divided into two sorts, to wit, such as are more gentle, and those that are more strong; whereof the former carry their force, and power or virtue in view (as it were) declaring their irritative or provoking quality by manifest signs; as when a Decoction of Hyssop or Carduus, an infusion of the roots of Squills, or Radish, dissolved Vitriol, warm Water or Water mingled with Honey (if you drink a great draught of it) and the like (which upon the first sight or taste move the stomach) are given for Vomits: and when they are given, it oftentimes is necessary for them to be aided by the irritation of the palate and throat in order to their producing of a Vomit. Secondly, The stronger Vomits (which are more properly so called) are such Medicins, that if they are taken in a due quantity they move most People to Vomit; as for example, *White Hellebore*, *Nux Vomica*, *Vitriol*, with many Preparations of them and Mercury: which though they are useful, yea very necessary in Physick, yet in their nature and virtues, wherein their vomiting quality consists, they seem to differ very little from poison: wherefore if they are taken in a dose too great, they often are the death of the Patient. Now since it remains as the subject of our next enquiry to search how, and by what means these Medicins work upon the stomach and other parts of the Body, I shall in the first place lay down all the *Phænomena* or appearances which are worthy our observation in this kind of Medicins.

Vomits made of *Stribium*, and other stronger ones swallowed down into the stomach, do not use presently (unless in those that have queazy stomachs before hand) to irritate or disturb it; but afterward, sometimes sooner and sometimes later, the Patients feel a kind of maukishness and disorder; then the stomach is contracted and ascends, its orifice opens, and the Weazon moves briskly upward toward the Throat, being attended immediately with vomiting; which when it is over, those Entrails sink down (as it were) and are a little at rest: yet in a short time after, the maukishness and disorder of the stomach, together with the ascent of that and the Throat return;

and

The reason why
we vomit rather
than discharge
by Stool.

Vomits are ei-
ther stronger or
more gentle.

Strong Vomits
are next to
Poisons.

How they op-
erate in the Sto-
mach.

and are accompanied with Vomiting; and so now and then the straining and ceasing to vomit alternately succeed each other for several times together, till the force of the Medicins being quite spent, this operation ceases.

In the beginning of a Vomit, the stomach seems onely to be contracted upward, and not extraordinarily provoked. But after the convulsions of it are more strong and vehement, and diffuse themselves to a greater distance, in so much that the Duodenum, by an invested kind of contrary motion, directs all its contractions upward, and poureth all that is within it into the stomach, which makes the motion to vomit so much the stronger. Now if the irritation or provocation be still more augmented, not onely Spasms [*i.e.* contractions] distensions and swellings, and especially that more dangerous convulsion of the stomach, to wit, the Hickock succeed thereunto: but also for that the animal Spirits are disturbed throughout, and sometimes scattered or excited too much, there happen frequent Faintings, cold Sweats, and many times deadly convulsions of the Limbs or the whole Body.

After the taking of a strong Vomit, when the stomach begins to vomit, first that is thrown out that floats in the cavity thereof; then whatsoever viscous or clammy flegm, that sticks to the hairs, or is laid up in the folds of it: if the vellication or twinging continues, there are serous humours squeezed out at the mouths of the small Arteries and Nerves; then when the contraction is communicated to the Duodenum and the passages of it, the Gall and Pancreatick juice, being forced out of their channels and poured into the stomach, are there discharged: from whence it comes to pass, that cholerick humours are oftentimes last cast forth, and then very frequently men vomit meer Gall, and that in great plenty: which if it so happen, every time any thing is thrown out, there is a griping a little below the stomach on the right side, that creeps upward; which, no doubt, proceeds from the Gall that is expelled into the Duodenum, and from thence through the convulsive and invested motion of that Gut, poured into the Pylorus. If the irritation doth not yet cease, the Arteries (whose mouths are exceedingly provoked) send out humours from the whole mass of Blood to be evacuated by vomiting.

From this account of Vomiting, you may guess how and which way a vomitive Medicin works in the Stomach, to wit, when it is swallowed into the stomach, and hath mingled it self with the humour therein contained, impressing a tincture of it self is gradually received by the hairy veil which covers the inward surface of the stomach, and then the nervous fibres that make up the inner coat, and sustain or uphold this veil, do by degrees imbibe or drink in that virulent tincture; wherewith when they are in some measure sated, by reason of the disagreeableness of its juice, they begin to be wrinkled and much disturbed: whereupon the fleshy fibres that lie over them, being provoked by that pain which the nervous ones suffer, suffer at first some light convulsions in several parts here and there (from whence proceeds maukishness and disorder of the stomach) but soon after the spirits that reside in all of them which belong to the two inward ranks are excessively disquieted, and being at the same time exploded or discharged (as it were) cause very strong contractive motions to vomit, to the end that they may throw off by Vomit all that is troublesome to the nervous fibres: And when by this means those fibres are freed from that Medicinal juice which they had drank in, the inclination to vomit ceases for some small time, till the fibres being again moistened with a fresh supply of the same virulent tincture, which they quickly suck out of the hairy veil, are urged and forced to the same trouble and put upon a motion to vomit. And so for some several times the violent inclination to vomit comes upon a man, till such time as the matter of that venomous tincture be wiped clean away even from the hairy veil, and all at length thrown out, so as that the nervous fibres of the inner coat may never after imbibe or drink in the poison of it.

But it doth not therefore happen always that people cease to vomit, but though the Medicin be quite and clean thrown off, and no contagion of it left behind, yet oftentimes those Spirits in the stomach, being much provoked, do very difficultly lay aside their fury; in so much that may be irritated by any other juice (which the nervous fibres have imbibed) and moved to vomitive contractions, which they now and then do several times repeat: wherefore at that time if you would have your vomiting cease, take no drink either for food, or as a cordial into your stomach, but onely keep your self warm without, and go to sleep.

Moreover, Sometimes other Humours pressed out of the vessels, and especially the Gall, poured forth from the vessel that is prepared for the receiving of it, into the stomach, do not onely add strength to the vomit; but when its operation is over, persist or continue to provoke the stomach still on, and move it to expulsive contractions:

Phar. Rat.
Part I.

How they assist it.

what and of how many sorts the matter is, thrown off by Vomits.

How Vomits work.

Why there are intervals in Vomiting.

Vomiting not easily stopped.

Humours squeezed into the Stomach increase the operation.

Phar. Rat. yea, the nervous fibres thereof imbibing that yellow, nauseous humour, which is as provocative as the vomitive tincture it self, cause convulsions, and beyond the force of the Medicin, prolong the frequent inclinations to vomit in order to exclude that troublesome matter. For this reason, when the Gall overflows, seeing it is easily brought into the stomach, oftentimes excessive vomiting is caused by a gentler kind of Medicin, and is attended by horrid symptoms: for the allaying whereof, sometimes it is proper to give a Lenitive, or easie Clyster, to draw the swelling Gall toward the lower parts.

why Vomits work sooner in some People.

But whereas sometimes when a man takes a Vomit, the effect follows so immediately, that is to say, when a Medicin reaches the bottom of the stomach, but doth not enter deep into the fibres of it; the reason is, either because the hairy veil being partly wiped off (as in Gluttons and Drunkards it usually happens) the nervous fibres being made bare, are soon and easily provoked; or, because the Fancie loathing Physick, had made the Party qualmish before-hand: Or lastly, because the stomach being oppressed with a putrid conflux of excrementitious matter, was formerly of it self disposed to vomit. As to the nervous fibres, which by drinking in the vomitive tincture, have a sense of that disturbance; whereby the fleshy fibres are irritated or provoked into convulsive motions, they are the very same, that being very empty cause hunger; and being very dry, thirst; so likewise when they are filled with a grateful kind of juice which comes out of the food, they beget a complacence in the stomach, and refresh the whole Body besides.

How Vomits in a solid form work.

Since Vomits use to be administred either in a liquid or a solid form, it will be easie to understand how the former enter into the nervous fibres of the stomach, and fill them so as to provoke or irritate them; but of the latter some Physicians do justly doubt, how a little Dust or Powder, as of *Stribium*, or *Flower of Antimony*, given in the weight of three or four grains, should make such a strong Vomit, seeing that it looks very improbable that those fibres should in any measure be impregnated (at least not enough to cause a Vomit) by so small a Medicin, which would not easily get into them. To this we must answer, that such a Medicin given in a dry substance, is presently dissolved and imparts its virtue to moisture enough in the stomach; in so much that if you make an Infusion of *Crocus Metallorum*, the fibres of the stomach drink in the dissolved particles of Antimonial Sulphur, and are thereby provoked to vomitive contractions or convulsions.

Vomits do not work alike in all Doses.

As to what some affirm, to wit, That a Vomit, be it given in a Dose never so great, works no stronger than if it were taken in a small quantity, is altogether false, and a thing not to be experimented without a great deal of danger; for if there be several small parts of the Medicin at hand, they will impregnate a proportionate number of fibres, and enter deep into them, so as to provoke them very much: and consequently very great and frequent convulsions must of necessity follow.

Vomits do not work by a specifick virtue.

As to the vulgar Opinion, That Vomits raise and expel the Humours upwards by a certain specifick propriety, I think it very frivolous; for what kind of virtue that is, no man can tell, or so much as prove that there is such a thing in nature. In the mean while it is enough, for the understanding the reason of Vomits, to conceive, that the small parts of the Medicin, being very repugnant to Nature, are imbibed or drunk in by the nervous fibres of the inner coat of the stomach, and create a great commotion in them; and then, for the expelling of that juice quickly, and a nearer way upward, that the fleshy fibres of the other coat are irritated and provoked into emetick or vomiting convulsions. But what is urged by some, to wit, that white Hellebore applied to the Navel, and the Infusion of *Crocus Metallorum* given in the form of a Clyster, is a Vomit, I have found by frequent Experiments to be utterly untrue: Though if sometimes it so happens, why may not a violent irritation or disturbance made in the Guts, cause convulsions and inverted contractions, and so secondarily and by consent of the parts, produce vomitings in the stomach? (as well as when the same thing very often falls out in the Colick and Iliack passion or twisting of the Guts.) I formerly caused Wine, that was impregnated with the Infusion of *Stribium* to be injected into the jugular vein of a strong Dog, to the quantity of six ounces, and after five or six minutes he began to stagger, and totter as he went, and then to vomit excessively. Yet I believe that this effect was wrought by the Medicins working upon the Brain rather than the Stomach; since the like vomiting ensueth from anointing or bathing the head with the juice or decoction of Tobacco.

Vomits do not work upon peculiar Humours.

Nor do I think but that their opinion, who say some Vomits work upon the Gall, others upon the Phlegm, and others upon Melancholick matter, (bringing forth this or that Humour distinct from all others, and as it were, pure) is far from truth, and stands upon a very trifling foundation. But in the choice of Vomits, the chief difference

rence, to be observed, is, that in some cases you must give the milder Medicins, which may make no disturbance farther than the stomach, but may gently bring forth those things onely that float in the hollow of it, or stick to the coats thereof: though in other cases, the stronger are more convenient, that by creating a convulsion in the other Entrails too, all Excrements that lie in them, or are any where gathered together, may be removed from their station, and thrown out either upward or downward. But whereas sometimes a slimy, and as it were, phlegmatick matter is chiefly expelled, the reason is, because the load of the stomach is almost onely purged away, without stirring of the receptacles of the cholerick humours; yet when those vessels which received the choler are drained, the Excrement is, for the most part cholerick: The expulsion of a black humour depends most commonly upon the tincture of the Medicin; for Compositions of Vitriol dye the excrement black.

Phar. Rat
Part I.

As evacuation by Vomit is more violent than by Stool, so if it be consistent with the strength of the Patient, it doth more good in some cases than ten Purges: for by this means the ponderous phlegm that sticks in the folds of the stomach, and which all other cleansers would slip by, is cleared away as with a Besom; and so likewise the adjacent parts, as the Pancreas or Sweetbread, the Mesentery, the Spleen and Liver it self are violently concussed or shockt, in so much that all obstructions in them, together with all stagnations or settlings of the Blood and Humours whatsoever are very easily removed by this kind of Medicin. All strange Ferments, wherever generated in the Body, and also the deeper seminaries of diseases, are seldom rooted out without administering of Vomits; but especially in the distempers of the Brain and Nerves the use of Vomits is found to be very advantageous. For by this kind of Physick not onely the filth of the Stomach and Bowels, which vitiates the Chyle and Blood, is more plentifully cleared away; but also the glandules, which are the emunctories or Dreins of the Blood and nervous juice, and seated in the Bowels, are cleansed; the choler vessels and other receptacles of Excrements more copiously evacuated, so that they being emptied by this means, do more readily receive the Serum or Whey of the Blood, with other rejected or superfluous parts of both Humours, which otherwise would settle in the head: and besides all this, seeing there are an innumerable company of Arteries mouths that open under the hairy veil into the stomach; these when they are vellicated or twinged to any purpose by a Vomit, pour forth all the ill, malignant humors that are in the blood, in order to their being thrown out there by way of Vomit. And for this reason chiefly it is, that great Distempers are best cured by Vomits, and scarcely without them. For those Medicins being of a strong and active nature, do not onely expel the superfluous humours out of the Mass of Blood by twinging the Arteries, but by getting into the passages of the veins, which are there without number, they make the Blood float, and cause the serous part of it, with other less noble Humours to sink and separate themselves. But in the mean time Vomiting Physick is not to be used by all People without any distinction. For in some the tone of the stomach is too loose and weak, and their constitution so tender, that their Spirits presently faint with vomiting, and their strength is enfeebled; some also have their Bowels endued with extraordinary retention of such sensible impressions as are made upon them; and though they are long before they can be made to vomit, yet their vomiting, when once begun, is not easily stopped; yea, through their frequent straining to vomit, they are exposed to great loss of strength and oftentimes swoonings too.

If Vomits are convenient, they are better than any other Physick.

It is to be used with caution.

Wherefore, rightly to administer a Vomit, we must consider what shews when it is proper, what permits it, and what forbids it. Now Vomits seem to be proper, when the cholerick and bitterish Humour floats in the stomach, so as to cause a qualmishness, ill taste, or headach; so likewise if the stomach be oppressed with clammy Phlegm, as in the Green Sicknes, and in men after hard drinking and gormandizing. In many cases, where besides shortness of Breath, the stomach being clogged, is troubled with want of Appetite or maukishness, Vomiting is useful. Moreover when the stomach is beset with any strange ferment, so as to reject all that comes into it, even for the sake of remote parts, Vomiting oftentimes is used with good success: for by this means the choler vessels are mightily emptied, and so the Choler being the more plentifully purged out of the Blood, the feverish indispositions thereof are removed. And then again, in respect that the superfluities or stagnations of the nervous Humour are most easily cured by such evacuations as these, the use of Vomits contributes very much toward a cure in the Gout, Asthma, Epilepsie, Madnes, and many other distempers that are accounted great and herculean Diseases. 2. This remedy may be permitted to be used, if the Bowels are strong, and the Constitution of the Body firm, and especially in such persons as having shorter necks and breasts than ordinary, have their stomach and mouth nearer one another; and to this also doth relate facility, or easiness

This Indication of Vomiting.

Things that permit it.

Phar. Rat.

Part. I.

Things that prohibit it.

to vomit, looseness of the matter which is to be purged out with a ready faculty of separating of it, as also a sedateness of Nature, and as it were, leisure to apply her self to this work. 3. Those things that forbid Vomiting, are difficulty to vomit, or an indispositedness to it found by former experience, a tender and soft constitution of body, a slim tall stature, and weak Bowels, but especially if a man be inclined to a Consumption, with an ulcer in the Lungs, or spitting of Blood: so likewise a great and general indisposition, in which it is dangerous, lest the Humours should be pressed tumultuously out of the whole Body into the Stomach: so also an unusual boyling up of the Blood, fits of Fevers, and expectation of a Crisis [or time when to make a judgment of the Distemper] do totally exclude this kind of Physick.

The Medicins called Vomits, are usually distinguished according to their operations, into gentle ones, middling ones, and strong ones. As to the matter of which they are made, that is some parts of Minerals, Vegetables, or Animals; and they are either ungrateful to the taste and palat, as *Vitriol*, *Tobacco*, *Briony-root*, &c. or they taste well enough, as the *Mezerean Fruit*, the *Nux Indica*, the *Eggs of a Fish called a Mullet or Barbel*; or lastly, they are almost insipid, and without any taste at all, as *Flower of Antimony*, *Crocus Metallorum*, *Mercurius Vita*, &c.

CHAP. II

Receipts for Vomits, together with a rational account of some of them, as to their Preparations and Chymical Resolutions.

Take of Oxymel of Squils \mathfrak{z} i. β . of Wine of Squils \mathfrak{z} ij. mingle them, and make a Vomit.

Take of the Leaves of *Asarum* or *Wild Spikenard* fresh gathered from 6 to 9, and when you have bruised them, pour to them \mathfrak{z} ij. of White Wine; then strain it and take it according to order.

Take of the Powder of the Root of *Wild Spikenard* \mathfrak{z} j. to \mathfrak{z} iiij. of Oxymel of Squils \mathfrak{z} j. β . mingle them and take it in a draught of Posset-drink.

Take of the Salt of *Vitriol* \mathfrak{z} j. to \mathfrak{z} ij. or \mathfrak{z} j. and drink it in a draught of Posset-drink.

Take of the Infusion of *Crocus Metallorum* \mathfrak{z} β . to \mathfrak{z} j. or \mathfrak{z} j. β . and drink it in a draught of Posset-drink, according to order.

Take of the Infusion of *Crocus Metallorum* 3vj. of Wine of Squils \mathfrak{z} j. β . of the Syrup of plain Sorrel \mathfrak{z} β . mingle them and make a Vomit.

Take of the Sulphur of Antimony gr.vj. to viij. of cream of Tartar \mathfrak{z} j. mingle them and let it be given in the pulp of an Apple, or a Stewed Prune, or in a Spoonful of Panade.

Take of *Mercurius Vita* gr.ij. to vj. and take it the same way. Take also Flowers of Antimony, Aurum Vita, or *Præcipitatum Solare*, and mineral Turbith, after the same manner.

Those Chymical Vomits that are of chief note, are usually made first out of *Vitriol*, secondly out of Antimony, and thirdly out of Mercury.

Salt of Vitriol.

Vitriol Vomits.

Theophrastus
his Gilla.

Salt of Vitriol is prescribed several ways, to wit, out of Colcothar prepared in a Lie, out of Blew Vitriol, calcined (according to *Angelus Sala*) and out of white Vitriol purified by frequent solutions and coagulations; which Medicin is commonly called *Theophrastus's Gilla*, and is the safest of all others, as well as easiest to be had; but yet the two former Medicins are extraordinarily styptick or astringent, and for as much as they have endured the fire, somewhat corroding; but the latter being gentle and kind enough, doth amicably pluck together the fibres of the Stomach and makes them somewhat wrinkled; in so much that they at last (to excuse or shake off what is troublesome to them) betake themselves to contractions, and strain to vomit: but that is soon over, and the disturbance of the Stomach is presently appeased.

The use of it.

Salt of Vitriol is therefore of more esteem and value, because it seldom works beyond the Stomach, nor doth it as Stibiates do, cause Convulsions in the Bowels, disorders in the Blood, or fainting of the Spirits; yet it is said to have this fault, that it operates slowly, and sometimes hardly at all; and therefore after any one hath taken

Vitriol,

Vitriol, and drank a deal of Posset-drink, they are often fain to provoke themselves to vomit, by thrusting a Fether down their throat; or drinking Carduus Posset, or Oxy-mel of Squils.

2. Crude Antimony, whilst the mixture is entire, works neither by Vomit nor by Stool; of which the reason is, because the Sulphureous and saline particles, from which the Vomiting quality proceeds, being bound up in it, and stifled, as it were, by the rest, cannot exert their force; but when this mixture is dissolved by preparation, and somewhat loosened, those particles are made free enough and ready for action. Now if it be questioned, whether the vomiting quality depends upon the sulphureous or the saline particles? My opinion is, that it proceeds from neither of them apart, but from both of them together: because when the former are given distinct from the latter, as in the tincture of Antimony; or the latter from the former, as in the cerus of it, it never provokes Vomiting. I have elsewhere observed that particles merely sulphureous or saline, scarce move the Taste or Smelling, but that both of them together do very strongly affect those senses: and so I suppose it to be in the peculiar sense of the Stomach, that is to say, that that Sense receives its pleasure or disturbance from sulphureous and saline particles mixt together; as also, that all Cordials and Vomits consist of such Compositions which are either grateful or ungrateful. Stibium (that it may become an active Medicin) is usually prepared either by it self (as the Glafs or Flowers of Antimony are made) or with Salts, that is, either with nitrous Salt, as the Crocus of it, or with fixt Salt, as the Sulphur of it; or with acid Salt, as the Butter of it, and *Mercurius Vita*, which is made of it. There are many other vomiting preparations of Stibium, but those aforesaid are of greatest note, or most frequently used. Now for the right preparation of those and all other Medicins, you must first take special care to chuse your Antimony pure and unmixed with Lead. In this affair, besides the brightness of it, and the elegancy of its *Striae* or Streaks; the surest way to try it, is by calcining a bit of the parcel you would buy, with an equal quantity of Nitre, and it is a sign of its goodness if it all turns into an *Hepar* [of a Liver colour] and to dross; for otherwise a part of it sometimes melts into pure Lead. By this means I once drew out of one pound of Antimony $\frac{3}{4}$ of Lead.

Phar. Rat.
Part I.

Antimonial Vomits
Crude Antimony
no Vomits.

Wherein the
Vomiting power
of Antimony
consists.

How the Parti-
cles of it become
a Vomit.

1. Glafs of Antimony.

Take of the Dust of choice Antimony q.s. and let it be calcined in an earthen vessel, keeping it still in motion till it leaves smoaking, and gains an ash colour; then taking it out, melt it in a Crucible, and pour it upon a Table, or into a Basin; when it grows cold, it will turn to a transparent purple Glafs. The Dose of the Dust hereof is from iv. to vi. gr. and the Dose of the Infusion of it in Wine from 3 vi. to x. works very strongly.

Glafs of Anti-
mony.

The reason of the aforesaid preparation is (I conceive) this. The Antimony whilst it is calcining is long kept in motion, to the end that whilst the sulphureous particles do plentifully evaporate, the saline ones, which are apt to vitrifie, or turn to Glafs, may be gathered into a closer consistence; and afterward, when the Mass is melted by a fierce fire, these saline parts, getting hold of the earthy ones too which are attenuated, grow easily together into a Glafs; which also by reason of some sulphureous particles that are yet left in it waxes red, and is a Vomit. Now that Stibium when robbed of its Sulphur, either in great part or totally, turns into Glafs, is very evident from this instance; to wit, in as much as the Calx or *Caput mortuum* which is left from the Distillation of the Butter of Antimony, melts into Glafs, which yet is white and hath no vomiting quality, for as much as all the sulphureous particles ascended and left the Mass quite destitute of them.

The reason of the
Preparation.

2. Flower of Antimony.

Take a quantity of choice Antimony, that is pulverized, and sublime it in Cucurbita with an Alembick, or in Earthen Vessels made on purpose, upon a moderate Fire, either by it self, or with Sand or Dust of Bricks, or calcined Tartar mixed among it: the Flower rise yellow, Citron coloured and white; of which gather up the whitest and keep them for your use.

Flower of An-
timony.

In this Preparation of Antimony the salt and sulphureous parts, having separated themselves from the watery and earthy ones, arise and knit together; by which means when the Mineral Body is much loosened and dissolved, and the most active parts

The reason of
this Prepara-
tion;

Phar. Rat. (the duller, that rebate their force, being laid aside) are joined into one Body, this becomes an excessive strong Vomit and not very safe to take. The Dose is gr. ij. iij. or iv.

3. Crocus Metallorum.

Crocus Metallorum prepared.

Take of choice Antimony and the purest Nitre of each $\frac{3}{4}$ iv. pounded severally, and well mixt, put them into a brazen Mortar, and with a live coal set them on fire; they will flame and make a great noise; then let the remaining mass which will be reddish (and called from the colour of it Hepar or Liver of Antimony) be separated from the dross (that lies round about it, partly black and partly white) and keep it for your use: The Hepar is given in the substance to gr. iij. iv. or v. the Wine of its infusion from $\frac{3}{4}$ β. to $\frac{3}{4}$ j. or $\frac{3}{4}$ j. $\frac{1}{2}$. This works kindly enough, and is the most usual Vomit.

The reason of it.

The reason of this procedure is, because it hath Nitre pounded and mixt with Antimony and common Sulphur: for both mixtures are very easily fired, in as much as both particles, to wit, the nitrous and sulphureous too, that were requisite to any degree of kindling were copiously and intimately conjoined. By this deflagration or burning of it, the Mineral Body is sufficiently opened, and the particles thereof are loosened from each other, and though some part of the Sulphur flew away, yet there is enough left to make it of a Saffron colour, and produce an emetick or vomiting quality, by being joined with the Salt. In this preparation, if by mixing too great a proportion of Nitre the Antimony be calcined above the usual rate, the Mass that is left after the burning of it, being now impregnated with less Sulphur, becomes not red, but yellow, or of a Citron colour, and less apt to make you vomit.

4. Sulphur of Antimony.

How to prepare Sulphur of Antimony.

Take Salt of Tartar, or Wormwood, $\frac{3}{4}$ viij. and having put it into a Crucible, let it melt in Anemius's Furnace, then throw in by spoonfuls of crude Antimony powdered $\frac{3}{4}$ vi. let it flow or melt a quarter of an hour, then pour it out into a Silver or a Brazen vessel, and let the Mass being of a Saffron colour be sweetned with frequent ablutions or washings. The Dose is gr. v. to x. which works more gently and kindly than any other Preparation of Antimony.

The reason of it.

In this Preparation the fixt Salt, being melted by the Fire, opens the body of the Antimony, which is compounded chiefly of Sulphur and acid Salt; for whilst the Salts are so conjoined, the sulphureous particles become more loose, less sharp than the saline parts; and therefore though it be extraordinary red, yet it doth not much, nor very violently provoke the Stomach. Moreover by reason that the Sulphur is more loosened, and the Salt grown freer, the Dust of it easily gives a tincture to Spirit of Wine; which being altogether destitute of saline particles, and consequently deprived of its vomitive quality, becomes a great strengthener of Nature.

The Composition of Antimony and common Sulphur.

Now that Antimony and common Sulphur, like, it may be, many other things of the same kind, consist of an acid Salt and Sulphur joined together, is easily proved by many Experiments: For besides that such Compositions are very easily dissolved by fixt Salt; so likewise if at any time they are separated by a sulphureous menstruum, as Oil of Turpentine, Juniper, or Flax, the sulphureous particles are drunk in by the Dissolver, and the saline ones being left grow easily into Chrystals, which being distilled turn into an acid stigma or distilled liquor. This evidently appears in the Preparation of Balsom of Sulphur. But if the acid stigma, to wit, Aqua fortis, or Aqua Regia, be poured into powdered Antimony, and the Distillation be over a fierce fire, there will a great deal of Citron coloured Sulphur arise, which is not to be distinguished from the common sort: which is a plain argument, that common Sulphur consists chiefly of sulphureous particles joined with an acid Salt. Out of Sulphur of Antimony, prepared as is formerly described, I make a liquor like Oil, which being the purest Sulphur of Antimony, will gild Silver at the first touch, and is of excellent use in Physick.

5. Mercurius Vitæ.

Take of choice Antimony and Mercury sublimate, of each $\frac{3}{4}$ vi. which when you have pounded and well mixt together, distil them in a Glasse Retort by the heat of Sand; there will arise a gummy liquor like Ice, and very corrosive, which sticking to the neck of the

the Retort, if you put a live coal to it, will melt and fall down into the Receiver. *Phar. Rat.*
 This Liquor being purified by rectification, will, if you pour Fountain water upon it, *Part. I.*
 sink into an extraordinary white Dust; whilst the watery part in the mean time gains
 an acid taste like Spirit of Vitriol; and that Dust being sweetned and dried, is commonly
 called Mercurius Vitæ, but falsely; because it hath nothing at all of Mercury in it, and
 except it be warily administered, is oftener the occasion of death than a preserver of life,
 [as the name seems to intimate.] The Dose is from gr. iij. to vj.

In this Operation the acid Spirits of Vitriol and Nitre, being beforehand incorpora-
 ted with the Mercury whilst it is a subliming [or forced upward by the heat of fire]
 when they are again loosened by the fire, forsake that their first entertainment, and
 embrace the more hospitable particles of Antimony, and being elevated with them
 by the force of the heat, grow together into a substance like Ice; which consists of
 the whole Sulphur of the Antimony together with a quantity of its Salt, as also the
 acid stagma, or distillation of Nitre and Vitriol; and by reason of the salt particles it
 grows hard like Ice, as it on the other hand melts upon the fire by reason of the sul-
 phureous particles. This matter by pouring Water upon it, is precipitated into a
 white Powder; such as consists onely of Stibiate particles, much like the Flower of
 Antimony, whilst in the mean time the acid Salts being dissolved in a menstruum,
 or dissolving Liquor make it become sharp like spirit of Vitriol. But that this Powder
 hath nothing of Mercury, is evident from this, that being bereft of the congealing
 Salts, it resumes its former nature of Quicksilver, and is all gathered together in a
 Retort. Indeed those Salts are easily drawn away from the Mercury, and do of their
 own accord desert it, whenever they find anymore amicable body: and hence it is,
 that if you boil it, after it is sublimed, with plates of Iron, in common Water, the Salts
 will presently embrace the Iron, and the Mercury will recover it self again. This
 Powder is too strong a Vomit, but if you pound it with Sea Salt, and by frequent
 washings take away its sweetness, it becomes much gentler, and safe enough; in as
 much as the saline sharp particles of the Medicin are rebated and tamed by Salts of
 another nature. Moreover if it be put into Nitre, melted in a Crucible, when the
 sulphureous particles are totally taken away, it quite loses its vomiting quality, and be-
 comes mere Antimony that will make you Sweat.

The reason of the Preparation.

The Correction of this Medicin.

So much of Antimonial Vomits, the Particles whereof being dissolved in the Sto-
 mach, make a sulphureous-saline tincture, which the fibres of the Stomach imbibing
 or drinking, are thereby so vellicated or twinged, that the Convulsion which is there-
 in caused, being propagated every way into the whole cavity of it, as also into the
 Bowels near adjacent, as the Duodenum, the passage of the Gall and Sweet-bread,
 forces out all that is within them, and pours them into the Stomach, causing the Ar-
 teries also to discharge their serous or wheyish Humours; so that violent Vomiting,
 and such as long disturb us, follow thereupon. But it is probable, that some small part
 also of this vomitive tincture is received by the Veins, and being carried into the mass
 of Blood, by reason that it meets, and struggles, and joins with the Salt, creates pre-
 cipitations and expulsions of a certain kind of matter: and this is the reason that Di-
 stempers of the remote parts, as all cutaneous Diseases, Leprosies and Gouts are some-
 times cured by Stibiate Medicins.

*Stibiate Vo-
mits, and how
they work.*

But Mercurial Medicins (of which we shall now in the next place treat) do this
 much more effectually; for that they do not onely provoke twingings and vomitive
 expulsions in the Stomach, but cause like, by their more active particles, that are
 communicated to the Blood, many kinds of fluxes and dissolutions, precipitations, and
 separations of the Serum or Whey and other Humours; from whence proceed, besides
 Vomiting and Purging, discharges by Urine, Sweat, and sometimes spitting: which is
 the reason that in old Distempers, which are not easily cured, People have recourse
 to this Medicin as their last refuge.

*How also Mer-
curial Medicins
work.*

Mercury or Quicksilver, if it be taken plain and by it self, doth not vomit or purge
 any more than Antimony, or cause any other considerable disturbance in mans body.
 But if the mixture of it be dissolved, and its active particles being let loose, it be re-
 duced to a Powder, it becomes a most operative and forcible purging Medicin. Now
 though there are many ways of fixing this giddy, fugitive *Procesus*, and preparing it for
 Physical uses, yet these are the two chiefest, to wit, either by subliming [or forcing it
 upward] or precipitating [that is, making it sink.] Preparations of it in the former
 way are not properly reckoned among Vomits, but most of the latter kind ought to
 be reduced to this Head. But it will be enough for us to give you a short account in
 this place of some few thereof that are of greatest note. We therefore observe that
 Mercury is precipitated either by it self, or with Metals onely, or with Salts onely, or
 with Metals and Salts together.

*Mercury or
Quicksilver by
it self is not
purging.*

*How it is made
operative.*

Phar. Rat.
Part. I.

1. Precipitated by it self.

1. Mercury precipitated by it self.

Take of the best purified Mercury $\mathfrak{z}\text{ij}$. and put it into a Glas made on purpose. (which being somewhat like an Hour-glass, consists of a double bottom running out in the shape of a Top; but is broad and plain in both, as in the middle narrow, and hath a Nozel with a very streight orifice, reaching from one bottom into the belly of it) and place this Vessel in an Oven of Sand at equal poize upon a fire that must at first be slow, though afterward quicker, till part of the Mercury turns to an ash-coloured Powder; and the other part being raised into the upper bottom, sticks there like Quicksilver; then turning the Vessel upside down, put the upper bottom into the Sand; and so turn the Glas for several times till all the Mercury turns to Powder, which, having broken the Glas, you must gather together, and wash in fair water. The Dose is $\text{gr.}\text{iv. to v. or vi.}$ It almost ever causes vomiting, and doth not work at all by spitting.

The reason of this Procedure.

The reason of this procedure seems to be, in that the emanation or streaming forth of a continual fire, first loosens the body of the Mercury, by degrees dissolves the particles thereof, and at last separates them from each other, so that they mutually part, and being broken as it were into small crums, remain distinct; from whence it happens, that the most active parts, to wit, the saline chiefly, and the sulphureous ones, being set at liberty, cause great commotions in a Mans Body by vellicating the fibres and boiling up with the Salts: but yet this Precipitate works less upon the Salts which are in the blood, than Mercury præcipitated with Salts onely; because this latter very easily causes spitting, which the former doth not at all. As Mercury, so also some other Mineral Bodies, as Lead, Tin, Antimony, and Iron, are usually calcined into a Powder or a Crocus by the constant heat of fire.

2. Solar or Golden Mercury Precipitate.

Take of Gold purged with Antimony, and subtilly filed $\mathfrak{z}\text{j}$. of purified Quicksilver, or that which is drawn from Cinnabar and Sublimate $\mathfrak{z}\text{vii}$. and make an Amalgama [or Paste] in a Crucible, by throwing the Gold when red hot into the Mercury actually hot; Let this when it is well washed with Salt and Vinegar, and strained through a linen cloth, be digested in Sand with such a Glas and after the like manner as the Mercury precipitated by it self was, till it be reduced to a red Powder; and let it be sweetned with cordial Waters. The Dose is $\text{gr.}\text{ij. to vi.}$ and works most commonly by Vomit onely, nor doth it cause spitting, as saline Precipitates do. So likewise may the Lunar Precipitate, or the Jovial, be prepared.

The reason of this Preparation

The reason of this procedure is the same with the former, to wit, that the particles of fire, like so many pests, pound the Mineral body into small parts, and for a time do so break them, that they will not easily stick together, and unite. Moreover this Amalgama [or Paste] by reason that the Bodies of the Mercury and Gold are beforehand loosened from each other, will turn to a Precipitate much sooner than Mercury by it self.

3. Common Precipitate Mercury.

Mercury precipitated with corrosive liquors

Take of pure Mercury $\mathfrak{z}\text{ij}$. of *Aq. fortis* $\mathfrak{z}\text{iv}$. and having dissolved it, put it into an earthen glazed Vessel, wherein let it evaporate first over a gentle fire till the moisture be all spent; then increase the fire, and let it calcine even till the Vessel be red hot, still stirring it with an Iron Instrument till it gain a ruddy colour: Let the matter when taken out and powdered, be first sweetned with frequent washings in sweet water, and after that again kindle Spirit of Wine, and pour upon it, and so keep it for your use. The Dose is $\text{gr.}\text{ij. to v. or vi.}$ It works violently enough by Vomit, and causeth spitting more certainly than any other Precipitate of Mercury.

The reason of this Preparation

If you enquire into the reason of this Chymical attempt, I say, that the Mercury is dissolved by the *Aqua fortis*, in as much as the saline particles of the Menstruum [or Dissolver] meeting with the Salts of the Metal, do presently snatch such Salts to them, and consequently, when by the dissolution of the mixture all the other particles are set at liberty, and expanded every where lie lurking in the pores of the menstruum; but afterward when the moisture is consumed, the saline particles that are left, and exposed to view, do quite take off the force of the Mercurial ones within them, which are

are mixt in every part. Now the reason why Mercury being precipitated on this fashion with *Aqua fortis*, or *Aqua Regia*, grows red, and of another colour than when it is prepared with Oil of Sulphur or Spirit of Vitriol, is partly from the Nitre that always gives it a Flame colour (for Nitre is an ingredient of the former menstruum, though not of these later) and partly from the Mercury it self, whose particles when it is dissolved, so long as they are free and not hid in others, are of their own nature red, as you may see in Mercury precipitated by it self, and in the dissolving of it in Oil of Tartar, wherein it leaves a ruddy, that is, a Mercurial Powder:

Phar. Rat.
Part I.

Why it grows red in this case.

This Medicin consisting of Salts that are very corrosive, as well as Mercurial particles that are dissolved, in as much as it extremely provokes the fibres of the Stomach, causes most violent Vomiting, so that it is rarely given alone for this end. But if at any time it be taken, and having passed the Stomach and those first passages, it be carried into the blood; in as much as the native Salts thereof are thereby very much fermented, and with them the Mercurial particles being plentifully infused, and thoroughly mingled, are so entangled, that they can be discharged again no way better than by the *Ductus Salivales*, or Spittle-passages (as I have elsewhere shewn) for that reason this Medicin causeth spitting in many People before any other.

How Mercurial Medicins work upon the Stomach.

4. Turbith Mineral.

Take of Quicksilver purified, of Oil of Vitriol (or Sulphur prepared in the Bell) purged from the flegm, of each an equal proportion; put them into a Glassen Retort, and distill them, increasing their fire by degrees, till all the moisture be consumed, and there remain in the bottom a white mass, which, if you pour clear water upon it, immediately grows yellow. This when it is unsweetned (by frequent washing and burning of Spirit of Wine) and dried, may be given from gr. iv. to vi. or vii. It works by Vomit somewhat more gently than the common Precipitate, and sometimes also causes spitting.

The reason of this Preparation, as to the Precipitation of the Mercury, is the same as that of the former; but the remaining calx, or earthy part, is not red like the former, partly because there is no Nitre in it, and partly because the Mercury being less subdued, will not endure so strong a calcination, as that the Salts being for the most part scattered or carried off, it may shew its own, to wit, a scarlet colour; for if to the end it be forced by a violent fire, it will fly quite away; and therefore from the Salts that stick to the particles of the Mercury and hide them, there proceeds a whitish colour; which being afterward something taken away, there succeeds a yellowness. Moreover, in as much as the Mercurial particles are not so strictly conjoined with the Salts, and consequently are not brought into the blood by them in so great a quantity, spitting is not so readily and certainly the effect of this Medicin.

The reason of the Preparation

This Medicin may be prepared after a compendious manner, and not less effectually thus:

Take of refined Quicksilver, of Oil of Vitriol or Sulphur, of each ζ ij. put them into a Crucible, and first let all the moisture evaporate over a slow fire; then make the fire stronger to the end that the calcined matter may be the better fixed.

5. Aurum Vitæ.

Take of purified Mercury ζ v. of Solis very well purged ζ β . let them be severally dissolved in their proper menstrooms [or liquor to dissolve them] let the dissolved matter of both kinds be put together, and by distillation in a Retort, let all the moisture be drawn forth; let the remaining calx be calcined upon a Plate of Iron red hot, that the Salts most of them may be carried off, and let the remaining matter be sweetened by washing it in fair water and burning Spirit of Wine.

6. The Hercules [or strong Medicin] prescribed first by Bovius.

This Medicine will be the better prepared, if both the Metallick Bodies are dissolved in the same menstruum, which by the prescription of Thomas Bovius is thus performed:

Take

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Part I.



Take of calcined Vitriol and Nitre, of each one pound, distil them in an Oven for reverboration, pour the Liquor distilled into one pound of Sea-salt calcined, in a Glass Retort, and let it be drawn forth by the gentle heat of Sand, for it very easily arises: Let one part of this dissolve the Mercury, and the other the Gold; after which, putting both the dissolutions together, draw them off; and by frequent suffusions, adding every time a little less than a third part of the same menstruum, distil them again till the matter be sufficiently fixed, which being sweetened, you may keep for your use, as aforesaid. The Dose is gr. iij. to vi. or vij. Or,

Take of purged Mercury $\frac{3}{4}$ iv. of filed Gold $\frac{3}{4}$ β . make an Amalgama [or Paste] as aforesaid, to which when it is washed and put into a Retort, pour Bovius's forementioned menstruum, draw it off in an Oven of Sand, and by frequent suffusions, adding every time somewhat less than a third part of the same menstruum, distil it again, till the matter be sufficiently fixed; then calcine it upon a red hot Iron Plate, and unsweeten it by frequent washing and burning the Spirit of Wine. The Dose is from gr. iij. to vi. It works indifferently by Vomit, and in as much as it operates, beyond the Bowels, upon the mass of Blood, it is helpful often in great Distempers.

The reason of
both these Pre-
parations.

Now, for the reason of this Chymical procedure, I say, that whilest these two Champions struggling between themselves, get hold of, and weaken each other, a third (and sometimes a fourth) comes and binds them together somewhat faster, and breaks them into smaller parts. For not onely the Gold by the Mercury, but both of them are dissolved by the menstrua, and divided into minute particles; then when the moisture is drawn away, the saline particles of the Metals are joined with the Salts of the menstruum, whilest in the mean time the other metallick particles are intermingled, and shut up in the pores of the Salts. But yet this combination of theirs is not so close, as when the Metals among themselves, or either of them, with its proper menstruum, is by solution and coagulation reduced into a Precipitate. For in that compound Precipitate the menstrual particles, as well metallick as saline ones, being so many and diverse, cannot all be thoroughly united: wherefore that matter (as I have often observed) is usually not without much difficulty fixed and reduced to a Calx fit for medicinal uses; for if the heat whereby the menstruum is drawn off be too great, the Mercury will rise, and the Gold that is left will resume its own nature; but if the fire be weaker than it ought to be, the Salts will not join so fast as they should do with the metallick particles, but may be separated by meer washing; so that common Water, if poured upon the Precipitate, will quite dissolve it, and swallow into it self the whole matter, in so much that you must go to work almost anew, if you would make this Medicin.

The reason of the
Hercules of Bo-
vius.

The foundation of this Medicin is Mercury, upon the account of which it is expected that the particles thereof should ferment or leaven all the juices in Mans Body, and promote the expulsion of any heterogeneous matter that is gathered either in the Bowels or in the Vessels. The Gold seems to be added to tame the Mercury, and somewhat to rebate and take off the fury of it. Besides which, the Salts break both the bodies into small parts, and thereby the more easily lead them (as it were) into the mass of Blood, and all other more retired parts.

The reason of
this Menstruum.

In the Distillation of that Epicæne or common Menstruum that Bovius hath described (it being such an one as dissolves both the Metals) there are notable strugglings and contentions (as it were for Religion and Property) between the Salts: for when the Aqua fortis is poured to Sea-salt already prepared, it seizes (as it were) the Country thereof, and takes possession, as of its own Inheritance, driving the spirit of the Salt thence like a Person disfranchised, or banished his own Native Land. This is more plain, if at any time the spirit of Vitriol, being poured to Sea-salt calcined, be put to be distilled; for with the least heat of a Balneum or Bath of Sand, the spirit of the Salt will arise altogether pure, like one forced out of his Country, when the Stagma, or distilled Liquor of Vitriol invades its habitation. Indeed these Salts are too near of kin than that they should incorporate; and that is the reason that when they are put into an habitation too narrow for them, they being not able to unite, nor cohabit, the stronger usurps a dominion over the weaker, and turns it out of doors.

C H A P. III.

Touching the Cure of excessive Vomiting, as also of Medicins to stop it.

W Here Nature is put into a violent motion, she often goes beyond her bounds, and over-shoots the mark, in so much that sometimes she lacks to have a stop put to her career. This is evident in Vomiting, if at any time, through the operation of a Medicin, or other occasions, it be immoderate: and therefore it is the business of Physick, as well to assuage, as to provoke this fury in the stomach. How many ways and from what causes Vomiting uses to proceed without taking a Vomit, I have formerly declared; but besides that, it is obvious to our common observation that this evacuation, when caused by a Medicin, is sometimes so violent, and continues so long, that unless it be stopped by the help of Art, a mans life is thereby in manifest danger. As therefore in the Practice of Physick Emetick Medicins [or Vomits] are of necessary use; so sometimes, to stop that way of discharging [what is in the stomach] (as often as it is excessive or preternatural) we must use remedies quite contrary to the others, or Antidotes against Vomiting. I therefore shall shew, First, what Medicins cure excessive Vomiting, that is caused by taking a Vomit, and then, in the second place, how and by what remedies Physicians stop preternatural Vomiting, which proceeds from other causes.

Immoderate Vomiting proceeds either from an Emetick Medicin, or other causes.

As to the former, Vomiting that is caused by a Medicin, becomes more violent, and continueth longer, because the Animal spirits being extraordinarily provoked, and set on fire (as it were) do not easily or presently lay by their fury, but being often exploded [or discharged] cause violent motions to vomit, which they several times repeat. Moreover, that explosive force being begun in the stomach, is propagated oftentimes into the spirits that inhabit the neighbouring parts, and from thence into others, till at last sometimes it gets into the whole race of them; in so much, that after Vomiting there come gripes and convulsions in the bowels; after that, in the parts near the heart; and lastly, in the whole body, to the manifest hazard of a mans life.

The spirits are irritated or provoked either by a Medicin onely, which is disproportionate to them in quantity or quality; or over and above by other humours, as Gall, sharp Serum, and other things poured into the stomach whilst we are vomiting. Moreover in some People the Animal spirits are so tender and elastical, that when there is any motion to vomit, though but small, not onely those which reside in the stomach, but also all that are near it, are stirred into convulsive explosions. And hence it is, that many People when they have taken a Vomit, complain of the Spleen, [pains in] the Womb and other Bowels, as if they were very much out of order, and not easily recoverable, imputing the whole matter to vapours raised by the operation of such a Medicin, when really and truly that comes to pass by no other means than that the Animal spirits are put into too brisk a motion, and are not easily to be reduced.

The reasons of the former are explained.

In excessive Vomiting, caused by a Medicin, the Patient must be presently put to Bed, and plyed very carefully with outward, as well as inward remedies; and first of all, to appease the Inhabitants of the stomach, either you must use an hot fermentation made of the decoction of Wormwood of Pontus, Mint and Spices in red Wine, or a Cake made of Crums of toasted Bread, and dipped into hot Claret. Give the Party a Clyster of Milk and Treacle: let him be rubbed with warm clothes and bound hard above the Knee, to prevent Convulsions in those parts. In the mean time let the stomach be kept empty, unless in case of fainting; but as soon as he can take any Food or Physick, let it be Cordial Water, or hot burnt Wine. In an extraordinary commotion, if the Pulse allow it, Treacle of Andromachus, or Diascordium, as sometimes dissolved Laudanum, or Tincture of Opium are good.

The Cure of it.

In preternatural Vomiting, that is caused by other means, you must consider, whether it be critical or symptomatical. In the former case, we are to do nothing rashly or on the sudden; let not such a discharge, if the Body can bear it, be stopped by any means; but let the passage of the matter which is to be expelled, be made more easie or hastened, or turned some other way. And hence it is, that when any maukishness, or motion to vomit comes upon a man, it is proper to give him Ale, either in Posset; or by it self, or altered with the leaves of Carduus boyled in it, and sometimes also Oxymel, or Wine of Squils; or Stibiare. So likewise sometimes a Clyster will do well; and otherwhiles a gentle Purge carries off the matter that swells in the stomach an easier way through the Guts.

Natural Vomiting is either critical or symptomatical.

Phar. Rat.
Part I.

The latter is either idiosyncratical or affecting one proper part, or sympathetical affecting two, by consent. What Method we ought to use when the Stomach is first affected.

In symptomatical Vomiting the conjunct cause (as I told you before) either is in the stomach, where it produces such an effect, or in other parts, where it causes Convulsions, and by communication of the Nerves, causes motions to vomit in the stomach, as in fits of the Stone in the Reins, the Colick, Fits of the Mother, Meagrim, and many other Distempers it usually happens; the Cure of which sympathetical Vomiting depends upon the curing of the primary or original Disease.

When the stomach is first affected, the reason is, because the nervous fibres thereof being irritated above measure, set the other motive ones upon contractive expulsions. But they are provoked by an improporionate object, to wit, in as much as a certain matter lies upon them, which they cannot well concoct, subdue, or thrust down into the Guts; but must of necessity cast it out as soon as possible by way of Vomit. That matter grows so incongruous or unruly, either through its own illness, as it offends in quality or quantity, and disturbs the nervous fibres; or through fault of the stomach, that is, when the tone of it is loose, and the fibres thereof so weak, that they cannot master, or endure so much as the Chyle it self, much less excrementitious humours, but being impatient of all burdens: throw off all that is within, by Vomit. Of both which cases, since there are several instances and various ways of bringing it so to pass, I will here briefly lay down some of the chiefest, together with the remedies and the reasons of them.

The matter that gives the Vomit, being in the stomach, is either poured into it from other Vessels, or through defect, or depravation of concoction, is therein generated; but in both respects the present load ought first to be removed, and then care to be taken how to prevent its farther growth for the future.

That therefore the impure conflux of viscous matter may be cleared out of the stomach, let the Patient take a gentle Vomit of Whey with *Carduus* infused in it, or *Oxy-mel*, or *Wine of Squils*, or with the Decoction of *Camomile Flowers*, *Roots*, the Dissolution of *Salt of Vitriol*, or other the like Medicins; and then let the reliques be carried away gently by Clysters or Purging, with *Mastich* stomach Pills, Gum, or *Tinctura Sacra*, or the Infusion of *Rhubarb*. Moreover when the Blood being impure or putrid, brings new supplies of incongruous matter into the stomach, either through the Arteries or Choler vessels, which oftentimes overflow, and thereby disposeth a man to vomit, Blood-letting sometimes is good; and therefore vomiting in Women great with child is frequently cured by this kind of remedy. Those things also are helpful, that so temper the Blood, as that no adust or dry filth may be generated in it. Hence Whey, drinking the Waters, the Juices of Herbs, *Sal Prunella*, and the like, very often remove that disposition to vomit, in as much as that they set the Blood a float, and carry the drossie part of it another way. And these kind of remedies too will be useful, if frequent and daily vomiting proceed from the contention and struggling of the Gall and Sweetbread juice which rejoyne (as some think) into the stomach.

That Vomiting is more frequent and harder to be cured, which proceeds from incongruous matter, that is consequently emetical [or vomitive] and generated within the stomach; in as much as all things which the Party eats, through the vitiated ferment of the Bowel, degenerate into a provoking kind of putrefaction. Wherefore in this case, when the filth of the stomach is carried off by gentle Purges, the Remedies commonly called Digesters, are wont to be made use of; which, according as the fermenting juice of the stomach (which is most commonly of a salt nature, and sometimes of a sulphureous) differs either in fixedness, fluidness, or adustness, are of divers sorts, and work sometimes one way and sometimes another.

In belching and sower Vomitings, try the Medicins following, and take your measures for the use of them from the help you find by them.

Take of the Powder of Cuckow-pintle compound 3j. β . of Salt of Wormwood 3ij. of Sugar of Roses 3iij. make a Powder and give 3j. of it in the morning, and at five of the Clock in the afternoon, in a small draught of Mace Ale, and a Toast, or in distilled Water, or the tincture of Wormwood of *Pontus*.

Take of Powder of Ivory, Crabs eyes, and red Coral, of each 3ij. of calcined Coral 3j. of red Sanders and Cinamon of each 3 β . make a Powder. The Dose is 3 β . after the same manner.

Take of the Powder of *Lignum Aloes*, Citron-coloured Sanders, and Winter Bark, of each 3ij. of the whitest Chalk 3vj. of white Sugar 3 β . of Gum dragant dissolved, with Mint Water a convenient quantity, make a Paste, and form it into Trochies or Balls

How Vomiting that arises from a vitiated Stomach is to be cured.

Remedies against the too acid ferment thereof.

Balls of the weight of 3℥. of which let the Patient eat iij. or iv. three or four times Phar. Rats
a day.

Part I.

Take of the Tincture of Salt of Tartar 3℥. The Dose is ʒj. to 3℥. twice in a day in distilled Water made on purpose.

2. In sharp and hot Vomiting Medicins that have acid and vitriolick Salt in them are more proper.

That famous Medicin of Riverius takes place in this case.

Against the too
sharp ferment
of it.

Take of the Salt of Wormwood ʒj. give it in a Spoonful of the juice of Limons.

Take of prepared Coral 3ij. of Salt of Wormwood 3j. ℥. of juice of Limons 3iv. let them stand in a Glas big enough, and put to them of strong Cinamon Water 3ij. The Dose is one Spoonful or two twice in a day, shaking the Vessel first.

Take of the Powder of Ivory and Coral, of each 3ij. of Vitriol of Mars 3j. of white Sugar 3j. mingle them and divide them into 6 or 8 parts, and let the first part be taken twice in a day with a convenient vehicle, or matter to convey it down in [as Wine or the like.

In this case Mineral Waters that are purging, having a great deal of Nitre in them, as likewise Iron stone Waters, yea and our artificial Chalybeates or Steel-waters too, use to afford extraordinary help.

3. If the Stomach at any time by changing most things that are taken into it, to cholerick and bitter putrefaction (as it is often used to do) doth thereby incline to frequent Vomitings, then such remedies are most proper as are acid and bitter.

Against the bit-
ter ferment of
the Stomach.

Take of the Elixir proprietatis 3j. The Dose is ʒj. twice in a day in a convenient vehicle.

Take of the Powder of Rhubarb gr. xxv. of Salt of Wormwood ʒj. of Cinamon water 3℥. of juice of Limons 3j. mingle them, and take it either by it self, or with any other Liquor.

Take of the Powder of Cuckowpintle comp. 3j. ℥. of white Chrystalline Tartar 3ij. of Vitriol of Mars 3j. of Sugar 3℥. make a Powder. The Dose is 3℥. or ʒij. drinking upon it each morning a draught of the Tincture of Wormwood of Pontus, or Coffee.

Take of the Powder of Crabseyes 3℥. of Chalybeate Tartar 3ij. of white Sugar 3j. make a Powder. The Dose is 3℥. with a convenient vehicle twice a day.

The cause of frequent and habitual Vomiting proceeds oftentimes not so much from the matter irritating the stomach, as the weakness of the nervous fibres thereof, and their too great aptitude to be provoked; in as much as they being very tender and infirm, can neither concoct what comes in, nor endure the burden or load of them; but on the contrary are presently disturbed by any thing that lies upon them, and consequently, in order to expel and drive out whatever is troublesom to them, excite the fleshy fibres to put themselves into a motion of Vomiting.

Vomiting cau-
sed by the
weakness of the
Stomach.

Of this Indisposition there are two several cases: to wit, either this weakness of the stomach, being in the fibres themselves, is caused by inordinate ways, as by Crop-sick-ness, Debauchery, for last nights drinking constantly and to excess, frequent guzzling of Wine, or hot Waters, and other errors in our Diet; in as much as the fibres being beyond measure distended, or too much heated, and as it were roasted, cannot admit, or keep in them, animal spirits enough: Or secondly, those fibres, though well enough disposed in themselves, and through the obstruction of the Nerves in some part or other, are deprived of the due afflux of spirits, and consequently being languid and slack or lank, cannot indure what is brought in, but presently force it upward by way of Vomit. So I have known several persons, that without any uncleanness of the stomach, or languidness contracted by inordinacy, being troubled with a kind of Palsie in this part, have wanted an appetite, and were subject to perpetual Vomiting.

Vomiting cau-
sed by weakness
of the Stomach.
Two cases.

Either the fi-
bres are too
much relaxed;
Or the Nerves
are obstructed
so as that the
animal Spirits
cannot flow in
to them.

In the former of these cases, such remedies are proper, as may by their styptick or restringent virtue cause the fibres that are too much distended, and thin, to shrivel and contract

Phar. Rat. contract themselves into a lesser space; and also such, as by their grateful allurements
Part. I. may entice the spirits thither in greater plenty, and likewise refresh or recruit them,
 when weak.

Take of Elixir of Mynsicht's Vitriol 3j. The Dose is from gr. 10. to 15. twice or thrice a day, in a spoonful of the following distilled Water, drinking of the same thereupon 7. or 8. spoonfuls.

Take of the tops of Cypress m.vj. of the leaves of Clary m.iv. the outward rinds of 12. Oranges, Cinamon and Mace of each 3j. of the roots of Cyperus [one kind of Galingal] and the lesser Galingal, of each 3ß. which having cut and bruised, pour to them lb viij. of Mum. Distil them with the common instruments.

Take of the Tincture of Balsam of Tolu, and of the Tincture of Salt of Tartar extracted 3j. The Dose is gr. 20. with the same vehicle. Tincture of Wormwood prepared with the same menstruum, may be tried.

Take of the Powder of Wormwood leaves, of Myrtle dried in the Sun, of each 3ij. of Cinamon, and the flowers of red Roses, of each 3j. of Cubebs, of the roots of the lesser Galingal, of each 3ß. of red Coral 3j. make of them all a small Powder, then of the whitest sort of Sugar, dissolved in Cinamon Water, being made into Tablets 3vj. and let the weight of each Tablet be 3ß. Let the Patient eat one or two of them at any time when he will.

Take of the Conserve of red Roses vitriolated 3iv. of preserved Myrabolans 3vj. of Ginger pickled in India 3ß. the species of Jacinth 3ij. of the reddest crocus of Iron 3j. of Syrup of Corals, as much as will serve, and make an Electuary. The Dose is 3j. twice a day, drinking upon it a draught of the distilled Water.

*How the Palsie
 in the Stomach
 may be cured.*

2. In case of weakness or slackness in the tone of the stomach by reason of an obstruction somewhere in the Nerves, those Medicins which are antiparalytick, or good against the Palsie, together with stomach remedies too, will be of special use.

Take of Elixir Proprietatis tartarized 3j. The Dose is 5j. twice a day with the Water formerly prescribed. Tincture of the Salt of Tartar, of Coral and Antimony, may be used the same way. In this case Spirit of sweet Salt, as also Spirit of Sal Ammoniack, or the flower of it, do a great deal of goods. Vomits, Purges, and even Sweating Medicins are oftentimes helpful. I have known this Distemper cured sometimes by bathing in our Baths at Bath.

S E C T. III.

Phar. Rat.
Part I.

C H A P. I.

Of Purging and Purgative Medicins.

Purging seems to be a motion or disposition quite contrary to vomiting, or rather vomiting at the wrong end, because in one as well as the other we set forth from the same barriers of the stomach toward a different Race-end. For as in Vomiting, the inner fleshy fibres of the stomach being inflated or blown up at their left ends by the sudden incursions of the spirits, and consequently, being contracted, cause the bottom and sides of it to be drawn together, and upward toward the left orifice, that so the matter therein contained may be thrown out the upper way; so in Purging, the same fleshy fibres, being in the same manner inflated at the right ends, force all the body of the stomach together, and make it lean toward the Pylorus, which causes an evacuation by siege. Now as the expulsive motion begun by the stomach is continued, in Vomiting, through the Weazon, so is it in Purging, through the Guts; and is propelled on both sides by the fleshy fibres, from one part to another, till it get out. In both cases the motion of the Stomach is violent, and in a manner convulsive; nay now and then the one is changed into the other. For Purgation, if caused by a Medicin too strong and quick, does oftentimes produce Vomiting; and so on the other side, a Vomit is many times attended with a Purge: the reason of which is, because the animal spirits being vehemently provoked, and exploded or discharged, fly differently sometimes into these, and sometimes into those ends of the fleshy fibres; something after the same manner as if you spur a metled Horse too much, you will make him one while run forward, and another as much backward.

Purging therefore is an expulsive motion in the Stomach and Guts, which by reason that their fleshy fibres are swiftly and regularly contracted, is more frequent and nimble; whereby not onely the Chyle and Dregs of it, but also the droffie and corrupt part of the Humours which are there engendered, or brought thither from other places, are pushed on from part to part till they are discharged by siege, as through a Sink, or Common-Sewer. For the stomach being irritated by the sharp particles of the Purge, and so contracting it self more nimble and closely toward the Pylorus, poureth whatsoever is in it forth into the Duodenum, whilest at the same time the Guts also being twinged by it, repeat more frequent and greater expulsive convulsions, whereby the greatest part of what is contained in them, that was either gathered thither before hand, or attracted and drawn forth at that instant, is thrown out. Now Purging is onely the violent and forced performance of that evacuation, which Nature when sedate and undisturbed, designed to effect leisurely and by intervals; which also, when she is provoked she cannot perform without some sort of tumult and disorder. It is therefore requisite (in my opinion) to the more perfect knowledge of the Nature of Purging, that we first shew what kind of matter is properly contained in the stomach and Guts, and then what comes thither from other parts, to be evacuated by Stool. Which being premised, it will be easie to explain how and with what difference Purging Medicins perform their operations.

1. As to the first, The chief contents of the Stomach and Guts are the mass of Chyle, and the dregs of it that remain after the distribution of the nutritive juice; the slimy matter in these Entrails, which smeers over the hairy veil, and the water that sticks in the glandules thereof; to which you may add the serous water issuing forth from the mouths of the Arteries, as also the droffie parts of the Blood and Humours that are conveyed into the inner cavities thereof through the Cholera vessels, the sweetbread passage, mouths of Arteries, and likewise through the ends of the nerves fibres, and it may be other ways beside. For very frequently the filth of the whole Body is thrown out by passages in the Guts as it were through a Sink; which filth if it settle within, doth either swell, by reason of its great quantity; or is so sharp, that by lubricating [making glib] or stimulating [pricking or spurring, as it were] the billy, causes more frequent and plentiful evacuations.

2. Besides this kind of contents, there is also another sort resulting from them, and

Phar. Rat.

Part I.

The production
of it in the
Bowels.

Wind is some-
times the cause
and some times
the effect of ex-
tensions in the
Bowels.

How wind is
generated in
convulsive Di-
stempers.

Of the natural
expulsive mo-
tion of the Guts.

that is Wind, which being usually created in the Stomach and hollow of the Guts, more than in any other part of the whole Body, seems to be thus produced: whilst the food (which is concocted and digested in the Bowels) is dissolved by the ferments and heat of them, a great number of *effluvia* [or particles that flow from it] go out of it; which if they could get a free and open passage, would flie and vanish into air; but being shut up in a membrane and crouded together, make an heap (as it were) of vapours like unto wind, which oftentimes bloats and distends the Guts, and where it can find vent goes forth with violence, promoting evacuation in its passage; but when it is shut up and kept in, it causes very frequently the Gripes, and many times swellings in the belly. The Wind that is created in the Bowels by the dissolution of Food, is generated after the like manner as when Pearl or Coral, or other concrete or hard matter is put into a matrace [a Chymical Vessel] and dissolved by their menstruums [or dissolving Liquors:] for in such dissolutions there are a great many vapours that flow forth, which if they are strictly kept in, force the containing vessel to break and fly in pieces: so when the Food in the first passages is either dissolved, concocted, or fermented, a vast number of such small particles flow from it, which being gathered together and shut up within the membranes, cause wind, to the more copious increase whereof, there are also other things that contribute. For it is notably produced by the struggling and boyling of juices which are not easily to be mingled. For whilst foreign humours, or heterogeneous matter, and especially Medicins, ferment with the other things which are contained in the Stomach, a great number of particles that flow from them, are gathered into a vapour by the mutual refraction of them. Moreover since many exhalations arise on every side from the boyling of the blood, part of them breaking forth out of the Arteries into the cavities of the Bowels increaseth the stock of wind which is there already generated. But to the further augmentation of Wind, the extensions and convulsive swellings of the Bowels do likewise conduce. For whilst the membranes by reason of the greater explosions and inordinate excursions of the Spirits are very much distended, the inward cavity, like a bladder blown full of wind, is much enlarged; in so much that part of the Humour inclosed within that empty space (which is like a cucurbit after the flame is out) is rarified into wind; which afterward, when the membrane slackens, or remits of its distension, breaks out with violence, or ever now and then tumultuously breaks through the next passages of the Guts. For this reason, when any part of the Guts is obnoxious to convulsive extensions, through inflammation or setting of sharp Humours, there is wind also immediately produced, and grows extraordinary troublesome. Having opened a great many Bodies that died of an inflammation in the Colon, I have found in all of them the Guts extremely stretched, and as it were blown full of wind; which no doubt happened, not because the *status* or wind was first generated, and then had distended the Bowels; but the membranes being mightily stretched by the spirits which were much provoked, and exploded or discharged within their fibres, therefore these *status* or parcels of wind were produced secondarily, and by consequence to fill up the void or empty space. From this cause I before intimated that the Tympany did arise, and shall shew the same perhaps in another place more at large. Whereas therefore the increase of wind uses to be very plentiful in the Stone in the Kidnies, the Colick, Hypochondriack distemper, and Fits of the Mother, that is not the cause of such diseases, but the effect onely; that is to say, when in the Fits of such Distempers the membranes are extended, and the hollow Bowels swell with spirits which are violently exploded or discharged, a kind of moisture therein inclosed, is presently resolved into vapours (from which wind proceeds) to fill the empty space. And that is the reason that when the distention of the affected part is slackened, the *status* or wind that was so suddenly produced, is pushed forward by the falling together of the membranes, into some other part. So much for that which is contained in the Stomach and Guts, and is the object of Purging Physick, let us now in the next place inquire as to its subject, what kind of motion that of the Bowels is, whereby the matter contained in them, being softly moved forward, is leisurely, and by intervals thrown out, or being hastily tumbled down, is voided in an hurry.

Because, for the preserving of life, all Animals stand in need of frequent and plentiful feeding, it is therefore necessary that the reliques of the Food, which is constant altered into nutritive juice, should be seasonably carried off, and that thereby the dregs of the old nourishment should ever now and then give place to its new supplies. For when the more pure and perfect part of the chyle (in which the elements being totally dissolved, are freed from the bonds of mixture) are squeezed into the chylerous or chyle-carrying passages, that which remains, partaking of thick sulphur and sharp salt, contracts a grievous stinking scent; wherefore it ought to be removed

removed out of the Neighbourhood of the new mass of Chyle into the bigger Guts, and at last be thrown quite out of the Body. Which that it may be the better done, Nature hath planted an expulsive motion in the Guts, (that is almost constant, and as it were solemn or at certain times) whereby the dregs of the nourishment are pushed still softly on, and hath appointed many Spurs as it were, or incitements to the same.

1. As to the first, the expulsive motion of the Guts as well as of the Stomach, is performed altogether by the fleshy fibres of each bowel, that compose the middlemost coat, of which I have observed two orders or rows in the whole passage of the Chyle, to wit, from the *Oesophagus* or Weazon, even to the *Rectum*, or Arse-gut. The outward row of fibres in the Guts, runs all along upon the surface of them in a strait line, as you may see it expressed in Fig. 2. of the sixth Table: but the inward row or rank consists of annular or ringy fibres that encompass the passage of the Guts in every part, with thickset circles, as is represented in the third Figure of the same Table. And when both these kinds of fibres are contracted, at the same time they streighten the cavities of those Entrails in every dimension; which being performed successively and in order, as it were by several joggings of the matter contained, it must necessarily follow that all things therein contained must be pushed still forward slowly and with a kind of creeping motion, the former part being continually thrust on by the latter. This motion of the Guts is commonly called the Vermicular or Wormy motion, because as when a Worm creeps it is continued from one part to another like the creeping of a Worm; and according to the necessity of Nature, it is more or less performed at all times, even when we our selves do not perceive it; because indeed those Bowels ought to disburthen themselves by degrees; and lest they sometimes should be idle and desist from this their task, they are upon occasion stirred up with many incitements.

How it is performed.

For first of all the very bulk of the Chyle and the dregs of it, oppressing the nervous fibres of the inner coat, upon which it lies, with the weight of it, and consequently provoking them, impresseth upon them a sense of trouble; whereupon they presently, being already satisfied with nutritive juice, and weary of any other load, excite the fleshy fibres to vermicular or worm-like contractions, in order to thrusting of the matter contained still outward. When, in this manner, the contents or stuff contained in the belly, being pushed still leisurely forward from one part to another, are come down near the end of the Colon, because at that time there is a pressure felt by the muscous part of the *Rectum* or Arse-gut, therefore the voluntary motion helps the natural, whereby after the sphincter [or muscle that shuts the *Anus*, or Arsehole] is opened, and the muscles of the lower Belly pressed together, the excrements are forced out. Moreover the Instruments of Respiration do somewhat contribute to this expulsive motion of the Guts, in as much as they continually moving the lower Belly, to and fro, cause that which is contained in it, by their shaking of it, to move slowly forward.

How the expulsive motion of the Bowels is excited.

1. With the load and heaviness of this excrements.

Besides the forementioned irritation or provocation, by which the fleshy fibres are moved by instinct of Nature, and constant custom to frequent, and almost continual worm-like contractions, there are also some other incitements and various instigations that upon occasion do increase or hasten those expulsive endeavours, and oftentimes force them into convulsions; in so much that the Belly is compelled to cast forth its load in great plenty, with great impetuosity, and as though it were moved by a Purge. Now those internal provocations of the Belly are, first of all incongruous or immoderate diet, the corruptions of bad chyle, the copious dregs of the blood and nervous juice, or sharp humours that flow from the Glandules and other Emunctories or Drains of the Bowels, and especially out of the Gall-bladder and Sweet-bread passage; yea and serosities [or wheyness] or Humours that are superfluous and incongruous, settling within, and proceeding from the Blood, Nerves, or habit of the Body. Of the chiefest whereof (because in Purging they often discover themselves, and heighten the operation of the Medicin) I shall speak particularly, and in short.

2. By many other accidental causes.

1. First therefore Food, if in the concoction it be at any time perverted, or cannot be digested, very frequently causes a Lask; as after hard drinking over night, by inordinate Diet, eating things disagreeable, and other errors, or from depravations the Stomachs ferment often happens. Yea, for want of concoction, and sometimes through obstructions in the Mesentery or passage of the Guts, from too much sliminess of the glandulous coat, or in the mouths of the vessels, the distribution of the nutritive juice is hindered, and consequently the whole matter that is taken in, being gathered and restrained in the first passages, produceth more frequent and plentiful evacuations.

Food that is incongruous, &c.

2. The

Phar. Rat.
Part I.Gall and the
Sweetbread-
juice.Humours out of
the Blood, the
Nervous juice,
the habit of the
Body, &c. move
us to evacua-
tion by Stool.

2. The dregs of the Blood, and the nervous juice being gathered together in the Glandules of the Bowels, the Bladder of Gall, the Pancreatick or Sweet-bread passage, and perhaps in other receptacles too, if at any time they overflow through fulness or irritation, and are abundantly discharged into the cavities of the Guts (in as much as they there twinge the nervous fibres, or boyl up with other juices) they oftentimes cause a Lask. The Gall seems to be a kind of natural Purge, which flowing in a great quantity out of the Choler Vessels, causes Purgation of its own accord.

3. The Purgative matter being sometimes transmitted from a still more remote region, to wit, from the mass of Blood, the nervous Juice and its emunctories, or from the whole habit of the Body into the Guts, provokes the nervous fibres thereof, and consequently excites the fleshy ones into expulsive convulsions. For in the aforesaid parts and places, and especially in the mass of Blood, the ill superfluous humours that swell there, being not easily or sufficiently to be purged by Sweat, or Urine, oftentimes retire inward, and flow out at the mouths of the vessels that are in the Guts and gape very thick to discharge them, whereby they cause frequent and waterish Stools. Yea sometimes the Blood it self, when vitiated in its constitution, and apt to coagulate, if it circulate not readily through these small Vessels, breaks out frequently in a great quantity, and produceth a Dysentery. But you may observe, when the external pores are bound up by the cold from without, or that Tumours or Swellings in the Skin, do suddenly disperse themselves, that they are commonly attended by a Looseness. I have known many People who have been subject to be bound in their Bodies, to have been cured with this sort of remedy; to wit, by rising early in the morning out of their Bed, before the usual time. For look how much is taken away from the wonted perspiration, so much is added to the lubricating [or making glib] the Guts.

These things being thus premised concerning the divers sorts of matter contained in the Guts (as well that which it generated there, as that which comes out of other places) as likewise touching the expulsive motion (both natural and constant, as well as violent and compelled) of these Bowels, and also of the various incitements or provocatives, whereby the Belly either of its own accord is naturally loosened, or inordinately disturbed, it will be easie to shew you how, and with what difference Purging Medicins move the Stomach and Intestines to evacuations, and cause that which is in them sometimes severally, and sometimes jointly to disembogue.

How Purges
work upon the
Stomach and
Guts.

When Purging Medicins are taken in a liquid form they are immediately ready enough to operate; but if they consist of a solid substance, and being so swallowed into the Stomach, are dissolved and impregnated by the ferment thereof, they make as it were a kind of Tincture, which in the same manner as the Purging Liquor becomes Cathartick [or evacuating] as follows. That kind of Liquor being shut up first in the Stomach, and then in the Guts, immediately impregnates the hairy threads of the inner coat with its glandules, and whilst it sticks close to them, the particles of it enter into the nervous fibres, and blood-carrying as well as chyle-carrying vessels, provoking each of them, as also the choler-passage, and that of the Sweet-bread, to give up and spew out, as it were, that which is in them. In the mean while, when the nervous fibres of the inner coat are twinged partly by the Medicin that they have drunk in, and partly by the humours squeezed into the cavity of it, the fleshy fibres of the outward coat begin to suffer expulsive contractions, whereby to remove all that which is troublesome to them. How these things are performed; first in the Stomach, and then successively in all parts of the Guts, and what kind of Humours are drawn forth in the whole passage, we will consider a little more accurately.

How they act
in the Stomach.

1. As to the Stomach, it seems to be as follows; that is to say, the Cathartick or Purging Tincture being diffused in the Stomach, doth first impregnate the hairy threads of the inner coat, and sticking fast to them, is from thence by degrees delivered over to the nervous fibres; which having entered, and quickly filled, till they are sated with it, it begins at last to irritate or provoke them: and they being thereby presently shrivelled up, endeavour to dissolve or discharge the Liquor that they have drunk in together with their own juice and the slimy flegm that is between the wrinkles of the Stomach. Moreover some other particles of the same Medicin (whilst it stays in the Stomach) get into the mouths of the Vessels and Glandules, which they twinge, and make them to disburden themselves of serous matter and other Humours. So whilst the bottom of the Stomach and the nervous fibres are oppressed and provoked by such offensive things as these that are in it, the fleshy fibres being excited into expulsive contractions, draw the bottom and sides of the Stomach upward, and make it lean toward the *Pylorus*, that so the load within, together with the Medicinal Tincture, may be cast forth and transmitted into the Guts. Hence for a time the Stomach

Stomach enjoys some quiet, till the nervous fibres by drinking in a new stock of the same Tincture, that still sticks partly in the hairy threads, are again provoked; and when by that means a new load is poured into the cavity of the Stomach, and there disturbed, the fleshy fibres repeat the same expulsive contractions to throw it out; and thus are these things performed many times one after another, till the virtue of the Medicin be quite and clean washed out of the hairy threads, and that the spirits which reside in the fibres remit their heats; which sometimes easily and quickly comes to pass, in so much that the Stomach after one or two hours, is free from all offence which the Medicin gave it, and the remaining part of the disturbance is altogether removed into the Guts. Yet it frequently happens, that presently after taking of a Purge some People Vomit very excessively, and that notwithstanding they have thrown up the Medicin, yet they Purge very plentifully afterward. The reason of which is, that the irritation being too violent at the beginning, causes stronger convulsions, that is, such as happen in vomiting: but then when the force of that provocative is over or remitted, the gentler contractions grow purgative. For the virtue and manner of operating in a Vomit and a Purge doth not differ onely in their specifick qualities, but also chiefly in this respect, to wit, that the offence given by the provocation of a Purge may be longer and more easily endured, and at last transmitted to the Guts, but not so of that which is caused by a Vomit. But forasmuch as after the operation of a Purge that hath wrought plentifully by Stool, People sometimes vomit, the reason seems to be, because the Tincture of the Medicin which was deeply drunk in by the hairy coat, is not easily wiped away: whereupon, after many vain motions to evacuate, at last a contractive motion to vomit cleareth it quite away. 'Tis common for men, if they eat before their Stomachs are cleansed of the Medicin, to vomit mightily and be very sick withall; and the reason is, because through the hindrance or deprivation of concoction, the chyle degenerates into an incongruous and irritating putrifaction: though for the most part a Purge slips out of the Stomach too soon, and without sweeping away the dregs thereof, but layeth out its greatest forces upon the passage of the Guts. Now how that comes to pass, is the next thing that falls under our consideration.

Phar. Rat.
Part I.

The cause of the frequent repeated motions to Purge.

2. The Tincture of the Purging Medicin being thrown out of the Stomach, and thence carrying along with it a sort of excrementitious matter, flows into the Guts; where it presently impregnates the threads of the hairy coat in its passage through the Duodenum and upper part of the Illium, sticking fast thereunto; after which the particles of the Medicin being more plentifully diffused about those parts, get into the nervous fibres, and likewise into the passages of the Glandules, and other vessels, provoking the Spirits that reside in them, fermenting with the humours that abound therein, and forcing them out as it were by squeezing or milking of them, in so much that that causes a great disturbance in them: by which means the fleshy fibres being bloated and contracted by the spirits that are irritated, and driven to discharge themselves, are set upon expulsive contractions in order to cast forth that which is offensive to them. Hence it is, that when the upper part of the Guts is provoked to more frequent and strong vermiculations [or Worm-like motions] whereby to thrust the matter contained in them forward, the expulsive motion being begun there, is propagated to the other Guts, and then being stimulated, or provoked by the matter contained in the uppermost, which is thrust down into them, are put all along into expulsive contractions, till the excrement that is uppermost be voided, whilst there is still more and more comes into the room of it. The purging Tincture, as it is offensive to the Spirits, puts the nervous fibres upon shrivelling themselves, and causes very often most painful extensions, provoking the fleshy fibres also to expulsive contractions, as I have shewn: then forasmuch as it fermenteth with the Humours and matter contained in the Guts, it makes an ebullition or bubbling in the cavities thereof, creates wind therein, and variously bloateth and distendeth the containing membranes, and consequently produces evacuations of the belly, with gripes, or breaking of wind.

The operation of Purges in the Duodenum and the small Guts.

Whilst the nervous and fleshy fibres are thus provoked, through the spirits being irritated by the purging Tincture, to offensive sensations, and expulsive contractions; the passage also of the Gall and Sweetbread juice being twinged and shockt, pour forth their humours, spewing them as it were into the cavities of the Guts: by both of which, and especially by the Gall, if it flow too copiously, the membranes being vellicated or twinged as much as by the Medicin itself, are urged to more frequent and greater expulsions; and therefore when the excrements are died with the yellowness of that humour, it is commonly (though falsely said) that the Gall is drawn forth, and that peculiarly by such a medicin: but if the humours that flow out of those passages do mutually boyl up, and, as some think, struggle with each other very furiously, then there

How they work upon the Gall and Sweetbread juice.

Phar. Rat.

Part I.

And how upon
the Glandules
and mouths of
the Arteries.

there will be in the cavities of the Guts, a still greater disturbance, with a swelling of the humours and wind.

Nor are the Gall and Sweetbread juice onely squeezed, or pressed by the Purge into the passages of the Guts, but also there are serous humours (milked as it were out of the Glandules of the inner coat, that are bound up by being twinged, and likewise out of the mouths of the Arteries, which are rubbed against and opened) which more dilute or wash down the matter contained in the Belly, and not only by lubricating, but by irritating promote evacuation. But the very slime of the Guts that linears over the hairy veil, if it be washed off by such serous humours, and be wiped clean away by reason that the nervous fibres are shrivelled and shockt, is an addition to the excrements, and increaseth their bulk. Yea, sometimes when this slime is very much wiped away, and the mouths of the vessels are thereby much twinged, and as it were haven, pure blood comes forth and causes gory Stools.

Thus do Purging Medicins operate in the cavities of the Stomach and Guts, in as much as they provoke the spirits and ferment with the humours. But from what particles or ingredients of the Medicin this irritative or provoking, and likewise the fermenting quality proceeds, we shall by and by inquire; in the mean time I observe, that the operation of a purging Medicin reaches far beyond the first passages, to wit, into the mass of blood, the nervous liquor, and consequently into the brain, heart, and other parts or bowels.

How Purges
work upon the
Blood:
and also upon
the whole habit
of the Body.

I. As to the Blood, it is manifest that the particles purging Medicins are received into the mass of it, and circulate [or go round the body] with it, from this, that the Urine borrows its smell and colour from some of them. The Milk of a Nurse that hath taken Physick, purgeth the Child. Some Medicins evacuate the Water of those that are troubled with a Dropsie by Stool. *Resin of Jalap* uses to purge forth a Lieih Serum that smells like piss. Moreover from the common observation of both the Ancient and Modern Physicians, a Purge that is opportunely given in the declension of a Fever, draws forth the feverish matter that was before ripened and apt to come away. Wherefore I make no question, but that some particles of the purging Medicin are admitted into the Blood, and diffused through its whole body or mass. And indeed we need not trouble our selves to make any long enquiry about the passages at which it enters, for of necessity some particles of the purging Medicin being mixt with the nutritive juice, must creep in at the milky vessels. Moreover since there is a thick Wood as it were of Veins, inserted or planted in the inner coat of all those Bowels where concoction is performed, it will be natural enough to conceive, that some parts of a Medicin as well as of the Food, may be carried through these passages into the Blood; and being diffused in great quantity, first into the Veins, and then into the Arteries (if they are altogether heterogeneous [or of a contrary nature] and untamable) disturb the mass of Blood, toss it to and fro, and provoke the exoneration or exclusion of themselves as well as that of the Bloods dregs: but the Blood being so disturbed, and put into an expulsive fermentation, dischargeth the particles of the Medicin together with other recrements or dregs that are to be thrown out through the mouths of the Arteries belonging to the Guts (which at that time are likewise twinged and opened by the Medicin) into the cavities of those Entrals, in order to their immediate evacuation. In this manner the serous or wheyish excrements and corruptions or superfluities of the Blood are purged out of its mass, together with the purging Tincture that is remanded [or sent back] into the Guts. Moreover when the blood vessels begin by this means to be emptied, then other superfluous or dreggy humours, that were settled about the Bowels, Heart, Brain, or habit of the Body, are again sucked into the mass of Blood, and being drawn immediately (whilest the expulsive fury of it yet remains) toward the Guts, are cast forth any way that is then open; by which means purging Medicins work upon the whole Body, and draw forth incongruous and noisom matter from all parts, be they never so remote.

As therefore I formerly observed that there were three degrees of a Lask proceeding from Humours, or a natural Purge; so I thought fit at present to make as many kinds or ranks of Purges that are caused by Medicin. The first of them I take to be when by reason that the nervous fibres of the Guts are gently irritated, the fleshy ones being contracted beyond their usual rate a little faster and stronger, thrust forward all the looser matter that is in them more swiftly from one part to another, till at last they kindly cast it forth. In the second sort of Purgation, some other Humours that are pressed out of the Gall passage, the Sweetbread passage, and mouths of the vessels which are vellicated by the Medicin, are voided together with the excrements of the belly. In the third, not onely these passages being more vehemently provoked, do pour forth a greater quantity of Humours of all kinds into the cavities of the Guts, but also there

Fig. I.

AA. p. 40.

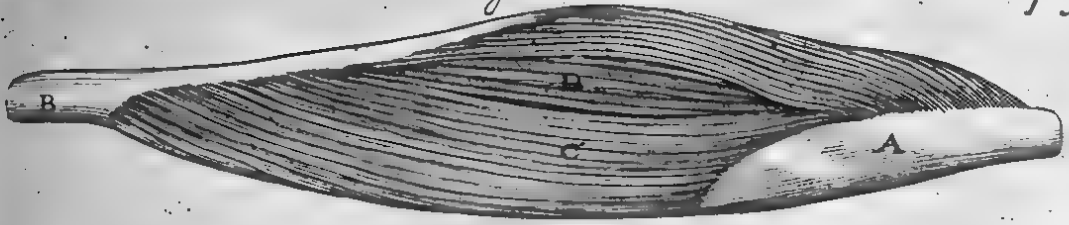


Fig. II.

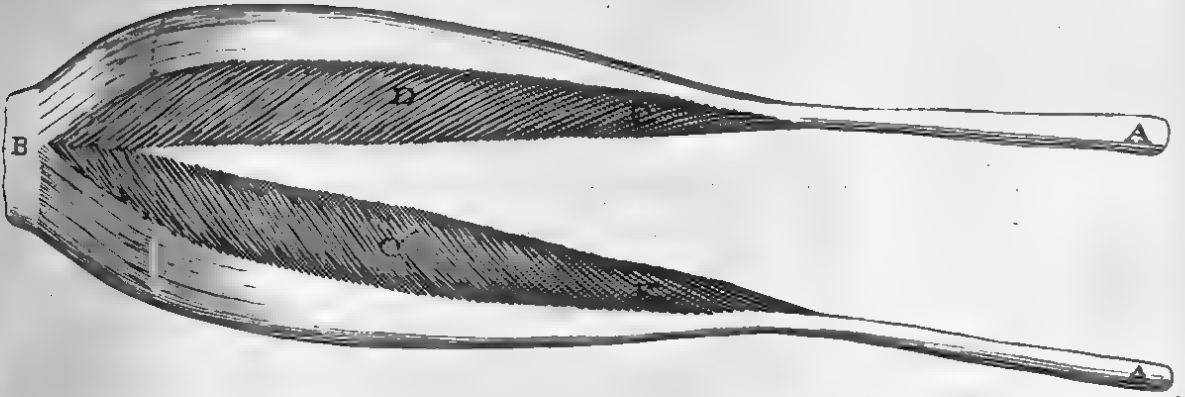


Fig. III.

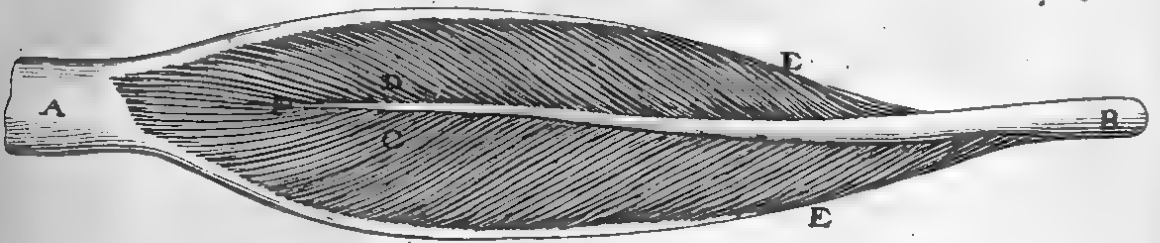
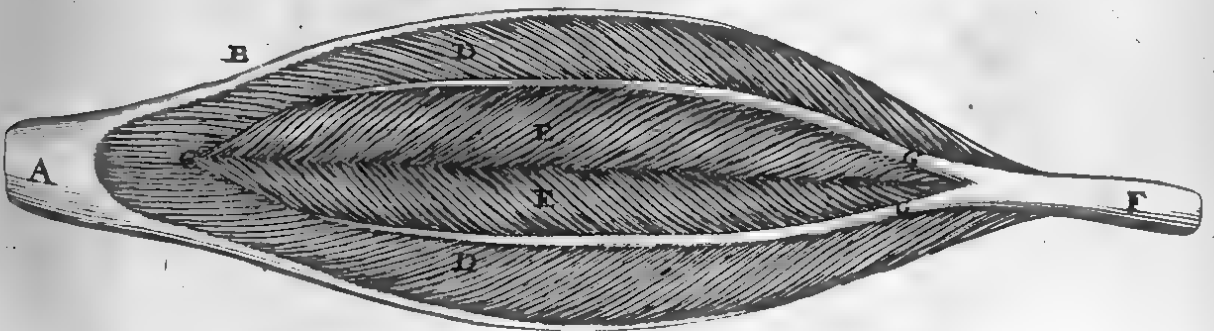


Fig. IV.



is a recrementitious sort of matter that is brought by the Arteries out of the Blood (which is dissolved and precipitated by the particles of the Medicin that are admitted into it) and by consequence also out of the nervous juice and other parts, into the Guts, through which it is evacuated. *Phar. Rat. Part I.*

Hence I think it is very manifest, that Purging is performed onely by irritation, fermentation, and expulsion, and not (as the Vulgar suppose) by attraction. Nor ought any Philosopher or other, that pretends to give the reason of things, or to use his own, to assert, that any Medicins through the similitude or likeness of their substance, or by reason of any (I cannot tell what) specifick qualities, act upon any particular and determinate humour, so as to purge that forth peculiarly by it self. But whereas sometimes Gall, Phlegm, Serum [or Whey,] or Melancholy [black choler] is supposed to be separated and discharged apart from any other, that seems to be, either because the Medicins provoke the Entrals in a different manner, or that they ferment divers ways with the Blood and other Humours: or lastly, that they give a tincture or die to the very excrement it self. And it will be worth our while to give some reasons and instances for each of these cases.

First therefore Medicins, according as they contain particles that are more volatile or fixed, gentle or sharp, smooth or rough, do variously irritate or provoke the Bowels, and consequently cause expulsive contractions either weaker, or stronger, and sometimes in one place sometimes in another, sooner and with more force. For example, Roses, Violets, Cassia, Manna, and other the like, that are compounded of subtle and thin parts, most commonly disturb not the Stomach at all; but when they are got over the *Pylorus* they begin to irritate the nervous coat of the *Duodenum*, which is more exquisitely sensible, and before they go any farther, spend almost all their force there; and by that means the passage of the Gall being shockt through the vellication or twinging and shrivelling of that coat, the excrements are mixt with Gall when we void them. On the other hand other Medicins, as Gum Ammoniack, Opopanax, Sagapenum, Turbith, and the like, that consist of a thicker and more viscous matter and particles more obtuse or dull, are not so ready in their operations, as presently to provoke the parts, but when they are dissolved in the Stomach, and from thence got into the Guts, begin their vellications or twingings, not on a sudden, but when they are advanced some space, and have stuck for some time to their coats, and that below the passage of Gall: whereupon, besides the common excrements and some serous humours that are squeezed out of the mouths of the Vessels, they shave and wipe off the slime that covers the Guts, and thereby cause Stools that are seemingly petuitous or phlegmatick.

2. In as much as Medicins, being indued with particles of several kinds, do variously ferment with the Blood and other juices, they cause evacuations sometimes of serous, sometimes of cholerick, or other kinds of Humours. For some, as Aloes especially, and Rhubarb, because they contain in them particles of matter that is, as it were, adust, beget such like particles in the Blood; so also they excite the adust dregs thereof to motion, and force them more plentifully into the choler passages: so that when by this means the choler is more copiously gathered together, and flows out of its recepracles into the Guts, the excrements become more cholerick. I have known some that by drinking raw, plain Milk, to the quantity of two pints, have usually been purged, and voided excrements altogether yellow: The reason of which is, that the Milk it self turned to choler, as by bitter Belches and heat of the Blood, which was presently caused (as if the Gall swelled up) I might reasonably conclude. Moreover other purging Medicins, as *Falap*, *Colocynthis*, *Elaterium*, and some Preparations of Mercury, consist of sharp particles, which are often corruptive, and being admitted into the Guts, and thence transmitted into the Blood, do notably dissolve the mass thereof, and precipitate it very strongly into a serous or wheyish constitution; yea, sometimes they do as it were invenom it, and corrupt the temper of it. Then, if at the same time that the Blood is so dissolved, there be a vellication in the Guts, the serous dregs of the Blood, with its corruptions and meltings, are spewed out of the mouths of the Arteries, that are there opened, into the cavities of the Bowels, and by that means our Stools are very waterish. But if, after the Blood is so melted, as it were, by the Medicin, and injured in its temper, a man hath but few Stools, the Blood becomes still more depraved by that incongruous and corruptive mixture, and thereby gains a notable ill temperament; or else by distributing its dregs and corruptions into the habit of the Body, makes pustles and watery bladders break out in the Skin. For so, by the unskilful use of Physick oftentimes great evils do ensue. Nor is it for nothing that the vulgar are so afraid, if at any time a Medicin doth not work as they expect, lest the virulence thereby contracted and left in the body, after it hath lain there a considerable

Purges do not work by attraction or specifick qualities, &c.

The differences of Purging operations:

1. *From their different irritations in the Bowels.*

2. *As they variously ferment with the Blood.*

The ills that follow from strong Purges.

Phar. Rat. ble time, may at last produce bad effects: for from such an occasion sometimes Le-
Part I. profies, as it were, arise. Not long ago, a purging Powder (and as I supposed, Mercu-
 A notable ex- rial too) was given to a certain persons two sons at Oxford, by an Emperick or Quack; whereof the one was purged for the space of 24 hours an hundred times at least, with gripes and great fainting of his spirits; whilst in the mean time the other, who was something the elder, had never a Stool; but in a few days his hair came off, his nails grew black, and in a short time after watery Pusshes broke out all over his Body, which being hardened into one continued scabby scurff, fell away, and immediately new ones arose in the room of them: which Distemper, through the extraordinary viciousness of the temper of his blood, which was as it were poisoned, being altogether incurable, tormented the poor Youth most grievously for above two years before he could be perfectly cured. Nor is the mass of Blood depraved by Mercurial Medicins onely, but sometimes also by other Purges, taken from the Family of Vegetables, in so much that it cannot be restored, or renew under a long time. So that it is not without cause that *Helmont* complains and says, that purging Physick doth not always or onely draw forth Humours that are in the Body, but also by its corrupting qualities depraves them.

Whence came
the error of
elective Purge.

3. The error of elective Purging hath taken root yet deeper, from this, that Liquids which are voided through the belly (being they borrow sometimes their colour from the Medicin, are falsely believed, because they are cholerick or melancholick before hand, to be educed or drawn forth apart from other humours. Nothing is more usual, than for Urine and Siege too to be died yellow by *Rhubarb*, *Alloes*, Roots of *Termerick*, and some other Medicins that People take: so also the Infusion of *Senna*, and purging Medicins that have Chalybeate or Vitriolick ingredients in them, make the excrements which they evacuate, look black. Moreover a different constitution of Body, and temperature of the humours, produces divers appearances in the excrements. For since in some the choler Vessels swell with the humour they contain; and in others vitriolick Salts which are the Parents of that black tincture settle in the first passages, whilst some again by reason of their ill diet, have abundance of serous matter gathered in their whole Body, it therefore makes People think, that when such Stools follow upon the taking of such or such a Medicin (if it happens that one sort of Humours are purged by that which they commonly call a *Cholagogon* [or Gall-purger] and another sort by a *Melanogogon* [black Choler-purger] and so another by an *Hydragogon* [or Water-purger] that such Humours are purged by such a Medicin electively [or as it were out of choice.] Wherefore as to the choice of purging Medicins, although those classes or peculiar sorts of Medicins appropriated to this or that juice, do not at all please me; yet I think that all Purges are not to be used indifferently in all cases; but on the contrary, you must take the advice of a good Physician, who can tell how to distinguish between them, and according to the strength of the Patients, their temperament, the strength, and constitution of the Bowels, their ability, custom in Diet, and imagination, yea, and according to the nature of the Distemper, as also the time and condition of it, may apply a weaker or a stronger Purge, of hot or temperate, gentle or sharp, solid or liquid, or any other kind of Medicins.

Purging not
needful to pre-
pare the Hu-
mours.

The ancient Physicians, to whom also the Modern ones, (a great many of them) assent, affirmed not onely Purging to be elective, but also that a preparation of the Humours was previous, and as it were necessary to it: Wherefore in their practical Books, where-ever Purging is prescribed, you have very formally and pompously, as it were, a long Bedrol of Preparatives designed for such and such Humours; the use whereof, although it seems very plausible, yet is, methinks by no means advantagious; because indeed there are no such humours in nature, as I have elsewhere clearly shewn. But seeing Purges are not convenient at all times, nor in every constitution of the Body, for the right performing thereof there is required both opportunity and some sort of preparation too; both of which respect or concern not onely the first passages, but the mass of Blood.

What Prepara-
tion is requi-
red for Purging,

1. In respect of
the Stomach.

As to the first, If at any time the Stomach is oppressed with a load of slimy phlegm, or troubled with a boyling of the Gall when it swells, it is oftentimes in vain or irregular to purge, unless the matter contained therein be first cleansed away by a Vomit, or that their oppression and heat be taken off by Digestives.

2. In respect of
the Blood.

But as to the Blood, many times a Purge is unseasonable, and sometimes also incongruous; and in neither of these cases do Preparatives, but onely things that alter it, agree: for those imaginary Humours are not to be disposed for evacuation, but the blood it self ought to be reduced, either from a troubled and confused state to a calm; or from weakness or ill temper to strength and an even constitution. Whilst the Blood, as it boyls in a Fever, is disturbed in its mixture, Purging is always found

to be hurtful; and therefore it is condemned by *Hippocrates* and the Ancients: So *Phar. Rar.* also whilst the mass of it, being languid and weak, doth not rise to a due ferment, *Part. I.* all such Medicins are forbidden. Moreover when the Blood is excessively full of Choler or Water, or is inclined too much to coagulations or dissolutions, Purges for the most part do not remove such defects or depravations of it, but oftentimes increase them. But rather in such cases Medicins that alter the Blood are proper; that is, such as may destroy the hurtful separations or combinations of Salts, Sulphur, or Serum, and remove all other their enormities. Of which Medicins for purging, whether previous[or preparative] or (which most commonly are the better of the two) such as supply the place of a Purge, to wit, digesting and altering Physick, I shall speak hereafter in particular.

Concerning the Theory or speculation of purging Physick, I shall not say much more; unless it be, that seeing (as is manifest from what I have already told you) that Purges not onely provoke the spirits that reside in the fibres of the Bowels (some of them) to resent the trouble given them, and (consequently others) to contract themselves into expulsive motions, but also ferment the Humours and the Blood, compelling them into various dissolutions and separations of the parts; it remains that we enquire, upon what sort of particles, whether Elementary or Secondary, and (if I may so say) qualitative particles, both those qualities (as well the irritating as the fermenting quality) depend. Hereupon in general I have observed what shall hereafter be confirmed by instances, to wit, that the irritating quality which is usually exerted in the Bowels, and by the instinct whereof the purging contractions are caused, proceeds in no wise from the principles or particles of the Medicin, whether spirituous, watery, or earthy, no nor from the Salt or Sulphureous ones alone, but from them always joined together, and sometimes also when joined with others. For though that Salt and Sulphur are the chief instruments of purging Irritation, yet neither of them by it self uses to be so offensive to the Bowels as to excite the motive fibres into expulsive contractions; but when they are joined together, they exalt and sharpen each other; yea, they put our Bodies into a temperature which is very hurtful and never to be reduced. The tincture of Antimony, as likewise the Cerus of it, give no offence to the Stomach, but are rather grateful and cordial. But *Crocus Metallorum*, *Stibium*, Butter of Antimony, and other things prepared out of Sulphur and Salt mixt together, are excessive strong Vomits or Purges. In like manner I have elsewhere observed, that sulphureous and saline particles, when separated from each other and alone are grateful enough both to the smelling and the taste, but when they are intimately mixed with each other, gain presently a stink, or ranck rotten smell.

But now as to the purging Fermentation, it doth not so plainly appear, whether the same particles that provoke the spirits to expulsive contractions, do also dissolve the Blood and make it separate into several parts, so as to pour out the dregs of it through the mouths of the Arteries into the cavities of the Bowels. Indeed the Blood, like Milk, is usually dissolved and precipitated into serous Humours, most commonly by Acids onely, as I shall by Experiments and Reasons hereafter plainly demonstrate. Alkali Salts, fixed and volatile, yea, and nitrous too, do not at all dissolve the mixture of the Blood, but rather keep it entire, and restore it when dissolved; so likewise doth Spirit of Wine, and other things that are purely sulphureous; but so far are Acids from promoting purgation, that nothing doth more infringe, or weaken, and totally take off the purging quality of Medicins.

That therefore we may make a judgment concerning Purges by sense, I think it probable, that they (being endued with a taste that is most commonly sharp, and somewhat poignant) together with Sulphur, are impregnated with a kind of volatile and sharp Salt, which in the stronger sort of them, is in some measure putrefactive; and that such particles in them, which are sulphureosaline, do not dissolve the Blood like Acids, or other precipitating Salts, that is to say, by embracing some parts of it, more intimately and closely, and so separating them from their associates, to oblige them to become their own companions; but on the contrary, the purging particles, being disagreeable to the whole mass of Blood and all its particles, as also immiscible [or not mingleable with it] and untameable, put them all into confusion like themselves, and excite them to an expurgative effervescence [or boyling up]; which by the immediate assistance of the pulse of the heart, growing quicker, is not allayed or cooled before all heterogeneous parts are thrown out, together with some portion of the serous Humour wherewith they are mingled, and sometimes also other dregs of the Blood too.

The mass of Blood being impregnated with the particles of a stronger sort of Purge boyls up at the same rate, as generous Wines, when other sorts are thrown

The virtue of a Purge is either irritating or fermenting.

upon what particles both of them depend.

i. The irritating quality.

upon what particles the fermenting quality depends.

Phar. Rat.
Part I.

into the same Vessel, are said to ferment anew to expel that which is disagreeable to their body; and therefore sometimes they continue to bubble up in the Fat, till either the Vessel breaks, or their temper be quite vitiated. But this doth not happen so frequently to the Blood, because not onely the incongruous particles of the Purge are thrown out of the Arteries (which are open in all parts, but especially somewhat more apparently into the cavities of the Guts) but also the other parts of the Blood it self, which are vitiated and separated, are easily evacuated. Although purging Medicins too sometimes, if they are too violent, do much pervert the temper of the blood, and as it were poison it. For indeed some of them that plainly corrupt the blood, work by way of Lask, just as Cantharides do by Urine; that is, they in some measure melt and corrupt the mass of it, and then those melted parts of it together with the rejected particles of the Medicin, do by their sharpness very much provoke, or many times corrode the parts that they pass through. Wherefore let those that desire health or long life, avoid all Quacks that use hardly any thing but Mercurial and strong Medicins, more than they would a mad Dog or a Serpent.

CHAP. II.

The several sorts of Purges, with the Receipts and Reasons of some Compositions.

Scarce any
Purges made of
Minerals,
though Vomits
and Sweating
Medicins are.

The reason of
that difference.

Minerals do not much contribute to the number of things that are purging, though the best Vomits and Sweating Medicins are taken chiefly out of that Store-house: but purging Medicins, being of a middling and a different operation, cannot be formed out of those impure and harder substances. For if the purging quality, though never so correct, be in any measure left as a Spur, in the mixt body, whatever irritation proceeds thence in the Stomach, will prove a Vomit; but if that quality be totally removed, then there will be no evacuation caused in the Bowels, but through the virtue of some Reliques of the *Sal Alkali*, all the operation will end in Sweat. For vomiting Medicins seem to be such, as being not by any means to be subdued and tamed in the Stomach, but impregnated with sharp, and as it were, pointed particles (that is to say, Sulphureo-saline ones) provoke it to violent, expulsive contractions, to the end that they may be thence exterminated, or discharged by the shortest passage, which is immediately by Vomiting: on the contrary, Sweating Medicins though they cannot be subdued and tamed, yet if their sharpness be taken off, and their particles broken into round bits, as it were, which have no edge, they do not at all provoke the Stomach, but passing into the mass of blood, ferment it (as being unminglable and untameable) and put it into an universal heat, whereby they make way for themselves to evaporate along with the ferous Liquor and other dregs of the blood. But Purges being endued with particles that are incongruous, more dull, and weak, do not either immediately or vehemently irritate the fibres of the Stomach; but when they are got somewhat deeper into them, they first cause an offensive perception, and then, that they may cast forth what is troublesome without any great disturbance, they increase and multiply the usual expulsive and ordinary motions, that is to say, through the passages of the Guts.

Some Purges
are taken from
Minerals, but
are improperly
so called.

But some purging Medicins are taken out of Minerals, as *Mercurius Dulcis*, *Lapis Lazulus*, *Armenus*, and some other, which for all that, are improperly so called, for they are very uncertain in their operation, in so much that they are seldom used for that end by themselves, though with other purging Ingredients they are given very successfully.

Purges are taken
most from
Vegetables, and
are of various
sorts.

But when we come to Vegetables, here we enter into a Field that is broad, and largely planted with things that are purgative: which since they are of many sorts, are used to be recounted and distributed in several manner; that is to say, into the more gentle sort, the middling sort, and the stronger; so also into Gall-Purges [*Cholagoga*] Melancholy-Purges [*Melanogoga*] Phlegm-Purges [*Phlegmagoga*] and Water-Purges [*Hydragoga*]: and furthermore, into Excoproticks [or Dung-Purges] Minoratives [or lesseners] and Eradicatives, [or rooters out of any Humour.] I need not insist upon each of these divisions, but will reduce all Purges to three kind onely: that is, in the first place I will give you, such as make no great irritation in the bowels, and cause in the blood and humours no more than a gentle fermentation: of which sort are *Violets*, *Cassia*, *Tamarinds*, *Roses*, *Rhubarb*, *Senna*, *Myrobalans*, *Epithymum* or *Doder-*

The sorts of
Purging Vegetables.

der, *Caribamus* or *Wild Saffron*, *Agarick*, *Aloes* and the like. Secondly, Such as create *Phar. Rat.* not onely a twinging in the Bowels, but also a something stronger effervescence [or *Part. I.* boyling] in the humours; in so much in these latter great disturbances, and those sometimes feverish ones too, are raised; and in the former, [to wit, the Bowels] contractions, and gripes, though not very intolerable, are excited: in which rank there are placed *Scammony*, *Turbit*, *Hermodactyls*, *Mecchoaca*, *Falap*, *Ebulus* or *Dwarff-Elder*, or *Wallwort*, *Elder*, *Opopanax*, *Sagapenum*. In the last place I shew you such as vellicate or twinge and lance, as it were, the Stomach and Guts extremely; yea, such as very much disorder the blood and other humours with a kind of putrefactive quality, melting as it were, and dissolving the mixture of it. Such are *Heliebore*, *Elate-rium*, *Soldanella* or *Bind-weed*, *Euphorbium*, *Esula* or *Spurge*, *Coloquintida*, &c.

Vegetables do not always need, as Minerals do, any long preparation to open their composition; for they oftentimes whilst their mixture is entire (quite contrary to what I have observed concerning Minerals) work the more strongly. For such things whose virtue consists in a subtle and fugitive composition, ought not to be reduced into Extracts, Magisteries, or Quint-Essences by any great chymical trials or preparations: but many of them, as *Rhubarb*, *Manna*, *Cassia*, *Senna*, *Myrabolans*, &c. being reduced into Pills or Powder, or infused or boyled in a convenient liquor, work not onely better but more easily too; which, if they be tortured with too much artifice, either totally lose their purgative quality, or exert it very slowly and with some reluctance. It hath been usual to draw forth the tinctures of Vegetables by impregnating the liquor, into which they are infused, with Salts of Tartar or Wormwood; for by that means it quickly gains a deeper colour. Although I do not disapprove of this method, in as much as the fixed Salts of Herbs boyl up with the acid juices of the Stomach and Guts; yet I may lawfully discover the cheat that lies hid in it, for the Salts do not draw forth that full Tincture, but onely make it appear. For if you put the Salt of Tartar into an Infusion of *Rhubarb*, *Senna*, or any other vegetable, which is already made and strained, immediately the tincture or colour of it will become deeper: the reason of which is, because the Salt-fixed particles, being very obtuse or blunt, stop the pores of the Liquor, in so much that the rays of light are very much refracted in their passage: wherefore any tincture, which is made deeper by the Salt of Tartar, will become presently more clear and thin, by pouring into it the spirit of Vitriol, whose particles are sharp, without the precipitation of any matter at all.

Purgine Vegetables do not need much chymical Preparation.

Some of them are bettered by extraction.

what Salt of Tartar contributes to the extracting of a Purgine tincture.

But yet among vegetable Purgers, some are mended by Chymical preparation; for in those that are filled with Salt and Sulphur, in which active and kind particles can be separated from the more dull and hurtful ones, and be reduced into resinous, or otherwise compendious extracts, no question, but the resolution and new composition of them may be performed with good success. Wherefore, when we would rightly prepare some sorts of Purges, we extract with spirit of Wine, the sulphureous part, and something of the saline too, as in the resinous magisteries of *Falap*, *Scammony*, *Mecchoaca*, &c. For others we use saline menstruums [or Liquors to dissolve them,] to wit, distilled Vinegar, or Waters sharpened with spirit of Vitriol, or Salt of Tartar, and that in a double respect; that is, either that the Medicin may be composed in a less bulk and a neater form, through the separation of the active particles from the earthy matter; or that all the vehement or virulent qualities of the mixed body, may be drawn out or tamed.

It would be an infinite pains and trouble to me particularly to relate in this place all the simple Purges, with their Preparations, Dispensations, and Doses: but it is sufficient for my purpose, since the principal compositions of Purgine Medicins are Potions, Powders, Boluses, Morsels or Tablets, and Drinks or Infusions in Wine; to lay down some choice Receipts of each, and those of a threefold nature; according as the operation of the Medicin ought to be, gentle, middling, or strong; to which I shall add, in the fourth place, the Receipts of purging Medicins that are easily had, for the benefit of the Poor.

The chief Receipts for Purgers.

I. Gentle Potions.

Take of *Rhubarb* shreded 3 iiij. of *Citron-coloured Santalum* [or *Sanders*] 3 β. of Salt of Tartar 3 j. infuse it cold all night in water of *Cichory*, and of white Wine 3 iiij. β. of the clear straining 3 iiij. add to these of Syrup of *Cichory* with *Rhubarb* 3 β. of *Cinamon* water 3 iiij. make a Potion.

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Middling ones.

2. Middling Potions.

Take of the best Senna \mathfrak{z} iij. of Rhubarb, Agarick trochised, of each \mathfrak{z} j. β . of Citron-coloured Santalum \mathfrak{z} ij. of Salt of Tartar \mathfrak{z} β . of Coriander seeds \mathfrak{z} j. infuse it close and hot \mathfrak{z} iij. of white Wine and as much Fountain water, all night; of the straining thereof \mathfrak{z} iv. add to it of the Syrup of Citron or Oranges \mathfrak{z} j. of aqua mirabilis \mathfrak{z} ij. make a Potion. Or, Take of the Decoction of Senna Gereon \mathfrak{z} iv. of Syrup of Roses dissolved \mathfrak{z} j. of Cream of Tartar \mathfrak{z} β . of Cinnamon water \mathfrak{z} ij. Make a Potion.

Take of the best Senna, of Cassia Fistula, and Tamarinds, of each \mathfrak{z} β . of Coriander Seeds \mathfrak{z} ij. boyl in Fountain water \mathfrak{z} x. of it, till the third part be consumed of the straining clarified with the white of an egg, adding of the Syrup of Citron or Oranges \mathfrak{z} j. Make a Potion.

3. Strong ones.

Strong ones.

Take of the Decoction of Senna of Gereon (with the addition of the fibres of black Hellebore, and Agarick, of each \mathfrak{z} j. β .) \mathfrak{z} vj. of Syrup of Roses dissolved, or of Orange flowers \mathfrak{z} j. of aqua mirabilis \mathfrak{z} ij. Or,

Take of the best Senna \mathfrak{z} β . of the fibres of black Hellebore, of Turbith, of each \mathfrak{z} ij. of Citron-coloured Sanders \mathfrak{z} j. of Coriander seeds \mathfrak{z} j. β . of Salt of Tartar \mathfrak{z} β . make a close and hot infusion in \mathfrak{z} viij. of white Wine all night, of the clear straining \mathfrak{z} v. add to it of Electuary out of the juice of Roses \mathfrak{z} iij. Syrup of the Purging Thorn \mathfrak{z} vj. of Cinnamon water \mathfrak{z} ij. Make a Potion.

4. Potions that are easily had for the benefit of the Poor.

Take of Purging Flax one handful, of the seeds of sweet Fennel \mathfrak{z} ij. boyl them in Spring water, as much as is sufficient, to \mathfrak{z} vj. add of white Wine \mathfrak{z} ij. Make a Potion. In the same manner you may make a draught, to purge you, of the flowers of red Damask Roses; as also of the leaves of the Orange Tree, and of the Roots of Eupatorium of Avicenna.

II. Pills. First of a more easie operation.

2. Gentle Pills.

Take of Stomach Pills with Gum \mathfrak{z} j. to \mathfrak{z} β . of Tartar Vitriolized gr. ij. of Balsam of Peru as much as is convenient, make iij. or iv. Pills. You may make them in the same manner from a mass of Pill Ruffi, Mastich of Amber, or sweet Gum, and also of my Extract dissolved, the description whereof you may see in my Treatise of the Scurvy.

2. Middling ones.

Middling ones.

Take of Stomach Pills with Gum \mathfrak{z} β . Rosin of Jalap gr. iv. to x. of Tartar vitriolated gr. vi. of Ammoniack dissolved a convenient quantity, and make iv. Pills. In like manner you may make them out of a mass of Pills of Succinum, Tartarized according to Quercetan. So also in the room of Rosin of Jalap put of Scammony sulphurized gr. vi. to xij. or Rosin of Scammony gr. viij. to xiv. Or, Take of Stomach Pills with Gum, of each \mathfrak{z} j. of Rosin of Jalap gr. vi. to xij. of Balsom of Peru, a convenient quantity, and make iv. Pills.

3. The stronger.

Strong ones.

Take of Pill Rudy \mathfrak{z} β . Rosin of Jalap gr. viij. to xij. of Balsom of Peru a convenient quantity, and make iv. Pills to be taken according to order. In like manner you may prepare them out of a mass of Pill Cochy of Sagapenum. Take of the Pill of two ingredients \mathfrak{z} j. to \mathfrak{z} β . of Calamelas \mathfrak{z} j. make iv. Pills, to be taken according to order.

4. Those that are easily to be got, and of a less price.

Those that are easily to be had, of a less price.

Take of the Powder of choice Jalap \mathfrak{z} ij. of Diagridium \mathfrak{z} j. of Cloves Ginger, of each \mathfrak{z} j. of Ammoniack dissolved a convenient quantity, and make a mass. The Dose is \mathfrak{z} β . Take of Pill Cochy \mathfrak{z} β . to \mathfrak{z} ij. and make iv. Pills.

III. Powders. First Gentle ones.

Take of Rhubarb pulverized 3℔. of Salt of Wormwood ʒ℔. of Cloves gr. ij. make a Gentle Powder and give it in a spoonful of clear Cinnamon Water, or in a draught of Ale. Gentle Powders.

Take of the Powder of Senna major compound. 3℔. to 3j. give it in a draught of Posset drink.

Take of the Powder of the leaves of Senna ʒj. of Calamelas, gr. xvij. of Citron-coloured Sanders ʒ℔. make a Powder, and give it in a Spoonful of Panada.

2. Middling ones.

Take of the Powder of Diasenna 3j. of Cream of Tartar ʒj. make a Powder, and give it in a draught of Ale. Middling ones.

Take of the Rosin of Jalap gr. x. of Calamelas ʒj. of Cloves gr. vj. make a Powder, and take it the same way.

Take of the species of Diaturbith with Rhubarb 3℔. to 3j. of Cream of Tartar ʒj. to 3℔.

3. Strong ones.

Take of Turbith and Hermodactyls of each 3ij. of Diagridium 3j. of Ginger ʒj. make a Powder. The Dose is 3℔. to 3j. Strong ones.

Take of the Powder of Cornachinus [a Mans Name] 3j. give the Powder of Hermodactyls compounded, the same way; as likewise the Hydrotick, or Water-purging Powder of Riverius.

4. Such as are cheap and easily gotten.

Take of the Powder of the Roots of choice Jalap 3j. of Ginger ʒj. Give it in a draught of White Wine. So likewise of the Powder of the Roots of Mechoaca, as also of the Leaves of Senna to 3j. Take it in any Liquor. Cheap ones.

IV. Bolusses and Electuaries. First, Such as work gently.

Take of Lenitive Electuary 3℔. of Cream of Tartar 3℔. of Syrup of Roses a convenient quantity: make a Bolus. Take of fresh Cassia 3℔. of the Powder of Rhubarb 3℔. of Cream of Tartar ʒj. of Syrup of Roses as much as suffices, and make a Bolus. Gentle Bolusses and Electuaries.

2. Middling ones.

Take of Lenitive Electuary 3℔. of Cream of Tartar 3℔. of Rosin of Jalap gr. vj. of Syrup of Roses a convenient quantity, and make a Bolus. Middling ones.

Take of Electuarium Diaphanicum 3℔. of Powder of Hermodactyls comp. 3℔. of Syrup of Elder a convenient quantity, and make a Bolus.

3. Strong ones.

Take of Electuary of the juice of Roses 3℔. of Rosin of Jalap gr. x. of Cream of Tartar 3℔. Syrup of Elder a convenient quantity, and make a Bolus. Strong ones.

Electuaries are compounded of the same ingredients in a greater quantity, adding thereto Conserves of Damask Roses, or Peach Flowers: the Dosis being the quantity of a Chesnut, to be taken every day early in the morning, or twice or thrice in a Week.

4. Bolusses and Electuaries that are easily had.

Take of Powder of the Roots of Jalap 3j. of Mechoaca 3℔. of Ginger 3ij. of Cloves 3j. Such as are easily had.

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of Cream of Tartar \mathfrak{z} iij. of Salt of Wormwood \mathfrak{z} j. of Sugar \mathfrak{z} ij. of Syrup of Roses dissolved, a convenient quantity, and make an Electuary. The Dose is the quantity of a Wallnut.

The loosening Medicin called *Confectio Solutiva*, and that made of loosening Raisins, as also the *Diaprunum* [or Medicin made of Prunes] by Sylvius, are to be found in *Praxis Medica*, p. 30.

V. Morfels or Tablets of indifferent operation.

Morfels or
Tablets.

Take of the Powder of Mechoaca, and of Gummy Turbith, of each \mathfrak{z} β . of Scammony sulphurated \mathfrak{z} ij. of Rosin of Jalap \mathfrak{z} j. of yellow Sanders \mathfrak{z} j. of Cream of Tartar \mathfrak{z} ij. of Conserve of Violets \mathfrak{z} j. of Sugar dissolved in Rose water, and baked into Tablets \mathfrak{lb} j. according to Art; let the weight of each Tablet be \mathfrak{z} j. The Dose i. or ij. purging Tablets: in Sylvius *Praxis Medica*, p. 28.

VI. Infusions in Wine and Ale, or the like, or gentle Purgers.

Infusions in
wine and Ale,
&c.

Take of the Leaves of Senna \mathfrak{z} j. β . of Turbith and Mechoaca, of each \mathfrak{z} vj. of the fibres of black Hellebore \mathfrak{z} iij. of Cubebs, of the Roots of Gallinjal, and of sharp Cinamon, of each \mathfrak{z} ij. put them in a large Glass with four Pints of Rhenish Wine, and of Salt of Tartar \mathfrak{z} j. β . Let them stand cold and close six days, then put to them of white Sugar \mathfrak{z} iij. and strain them through Hippocrates's sieve. The Dose is \mathfrak{z} iij. or iv.

Take of the Leaves of Senna \mathfrak{z} iij. of the Roots of Polypody of the Oak, or Oak Fern, of Sharp Dock prepared, of each \mathfrak{z} ij. of Turbith and of Mechoaca, of each \mathfrak{z} j. β . of Epithymum or Wild Time, and of yellow Sanders, of each \mathfrak{z} i. of Coriander Seeds \mathfrak{z} i. β . Shreded and bruised, and prepare according to Art, a small Bag of them for iv. Gallons of Drink. The Dose is from \mathfrak{z} xij. to a Pint, every day early in the morning, or twice or thrice a Week.

The Reasons of some Chymical Preparations.

Mercurius Dulcis.

Mercurius dul-
cis.

Take of Mercury sublimate, corrosive \mathfrak{z} vj. of Quicksilver very well purged \mathfrak{z} iv. β . pound them together in a Glassen Mortar to a perfect mixture, then let them be sublimed in a Furnace of Sand, increasing the Fire to the height by degrees, for 12. hours, then sublimate them again and again, adding the Mercury, which in the subliming grew crude; at last when the matter is perfectly sublimated, pure and white, take out the dross, and gathering it together, keep it for your use. The Dose is gr. xv. to xxx. by it self, or with the addition of other Purging Ingredients, to carry the Mercury quickly off by Siege, without the danger of salivation.

Corrosive Mercury sublimate, out of which the *Mercurius Dulcis* is made.

Mercury subli-
mate corrosive.

Take of calcined Variol \mathfrak{lb} j. of Sea Salt calcined, and of the best Nitre, of each \mathfrak{lb} β . of purged Mercury \mathfrak{lb} j. pound them in a Glassen or a Wooden Mortar to a perfect mixture, adding a little Aqua fortis, or Spirit of Vinegar. Sublime them in an Oven of Sand, increasing the fire gradually to the height; do it over again, if need be, that the matter being sublimated to the sides of the Vessel, may gain a white, snowy colour. This business will go the better forward, if the Quicksilver be dissolved in Aqua fortis distilled out of the aforesaid Minerals, and then the matter, when the moisture is taken away, be sublimed upon a fierce fire.

The reason of
both.

Now as to the reason of the aforesaid Medicin, in the first place, concerning the corrosive Sublimate it is plain enough, that the Mercury is dissolved by Salts (whether they are in the Minerals themselves, or in the Aqua fortis) and being as it were coagulated with them, is sublimed by the force of the fire: and then that by the same Salts which congele the saline particles of the Mercury, and hide the rest of them within their pores, the snowy colour, as it were, is produced; and that at the same time the corrosive quality arises from the extreme sharp small surfaces of the same Salts. Furthermore, as to the taking off of that same sharpness by the repeated sublimation after the Quicksilver is added and incorporated, in almost an equal quantity; the reason

son is, because the sharp salt particles are so rebated and weakened by the Mercurial ones that are copiously augmented, and stick to them on all sides, that they do not prick or lance (as it were) the sensitive fibres at all in that manner as they did before: Besides, The Powder of this sublimate when it is pounded in the Mortar grows yellow by reason of the quantity of Mercury that doth as it were emerge. But that the common Precipitate, in which the Mercurial particles exceed the Saline ones that are congealed, is extremely corrosive; the reason is, because the small parts of the fire sharpen all the mineral particles, in as much as they drive out all the gentle atoms, and stick or cling to the mineral corpuscles themselves, which are excessively pungent or pointed.

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2. Rosin of Jalap.

Take of the Roots of Jalap, that is ponderous, black and bright, beaten somewhat thick lbj. of Spirit of Wine lbij. digest them close and hot for two or three days, then put the tinged [or died] spirit into a glassen Cucurbit [or Gourd] a Chymical Vessel so called and draw it off [or let it evaporate] till the fourth part onely remains; into which if you put or insill cold Water, the Rosin will sink to the bottom of the Vessel, which when you have washed from the dregs and dried it, you may keep for your use. The Dose of the Powder thereof is gr. vj. to xij. or xiv.

In this Preparation the Spirit of Wine extracts or draws forth the sulphureous particles of that substance, and so much the easier, in as much as these were before hand, of themselves, separated and gathered together in the mixed body; as you may conclude from the Veins which are rosin and shine. Whilest the sulphureous part is extracted, some quantity also of the saline seems to be joined with it; and that is the reason that this Rosin which smells very strong, and is sharp to the taste, purges violently, and is easily set on fire. This works stronger, and in a less quantity than the mixed body it self when it is whole, for as much as all the active particles are united together, and the dull ones removed.

The reason of
this Preparation.

3. Rosin of Scammony.

This is prepared in the like manner as Rosin of Jalap; but in this Medicin, in as much as the saline particles, many of them, fly away whilest it dissolves, and are not all gathered together in the Rosin with the sulphureous ones, the operation thereof is gentler and weaker than that of the whole mixed body. For though there be a great quantity of Sulphur in the Scammony, yet the operation thereof depends very much upon the saline particles: wherefore whilest the Powder of it is smoked by Sulphur burnt under it, the purging quality is much weakened; in as much as the acid Salts that are sent forth with the Smoke, do subdue or fix the particles of that mixt body which are otherwise saline. After the same manner as out of Jalap and Scammony you may make rosin Extracts out of Turbith and Mechoaca.

Rosin of Scammony.

4. Extract of Black Hellebore.

Take of the fibres of black Hellebore lb. bruise them in a stone Mortar, sprinkling them with 3 iij. of the best spirit of Salt; then put them into a Matrace, and pour to them 2 pints of thin spirit of Wine impregnated with Salt of Tartar till it grows yellow, adding of Lignum Aloes and Cloves bruized, of each 3 ij. Digest them close and hot in Sand for three or four days; then filtrate all the Liquor, and let it evaporate over the heat of a gentle Bath to the consistence or thickness of an Extract. The Dose is from ʒj. to ʒj.

This Medicin works in a lesser quantity and more gently than the Powder of the roots, because the active and benign particles being separated from the rest, which are both duller and virulent, as likewise being more fixed and subdued by the Salts of the Menstruum are of themselves reduced to a mass: And moreover, by reason of the Salts joined with it, which boyl up and ferment with the Salts that are in the Bowels and Humours of our bodies, it is more effectual.

So much for Medicins; that being swallowed into our Stomachs, direct your operations most commonly through the most open passages, and as it were, the Kings Highways, to wit, upward or downward, through the Weazon into the mouth, or through the Guts to the Anus, or Fundament. There are a great many others of several sorts, which, designing to go both the ways that those do, exert their actions upon the blood and the nerves with different respect to the Heart, Brain, Reins, and other Bowels, or the habit of the whole Body. Of which at last we will speak in their turn, after that I have said somewhat first of excessive purging, and especially of the Dysentery [or Flux] at London.

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Part I.

C H A P. III.

Of the Remedy for excessive Purging, or of Medicins that stop too violent Purgation, or a Lask. As also of the London Dysentery, into the Nature and Cure whereof we here inquire.

TO order Purges as well as Vomits aright we must make use of Bridles as much as Spurs, that is, something to restrain Nature, as well as to provoke it. For as Purging Medicins are sometimes of necessary use to lubricate the Belly, or to cause a plentiful evacuation; so, if that evacuation be immoderate, or not easily to be born, you must apply remedies that are contrary and antidote to a Lask of Flux, called a Dysentery. How and in what manner purging Medicins perform their operations, and also for what reasons, and upon what occasions spontaneous Purging doth frequently happen, I have formerly shewn. At present I shall lay down in every case, to wit, both in excessive Purging caused by Medicins, and also in a Lask and Dysentery, the ways to cure them, with the choicer Receipts for their Remedies.

The reason of excessive Purging caused by Medicins.

A purging Medicin that is disproportionate either in quality or quantity, worketh more strongly and longer, not onely for that, by irritating the nervous fibres too much, it forces the animal Spirits into disturbances that are not easily appeased, but also in as much as it dissolves, and as it were, melteth the bloud and humours; so that the melting parts of them being discharged into the cavities of the Bowels create still greater expulsive irritations.

The care to prevent it;
1. *Before the Medicin is given.*

2. *In the operation of it.*

3. *After the operation of it.*

The method of Practical Physick respecteth both the prevention and curing of excessive Purgations. As to the first there is need of consideration and care before the Dose is given, in its operation and after it. For first of all you must cautiously weigh the constitution, strength and usage of the body that is to be purged; then the nature, dose, manner of operating, and ordinary effects of the Medicin that is to be given: and lastly, it must be considered, from comparing of Symptoms or Tokens, how to proportionate the force of the agent to the strength of the Patient. Secondly, Whilst the Medicin is a working, see that the Bowels that serve for concoction as also the bloud and animal spirits be kept free from all other disturbance. Wherefore at this time you must eat nothing that is thick or clammy, or so much as to molest the stomach; and have a great care of the outward cold, whereby the pores of the Body are bound up; in fine, let the mind be always calm and serene, and void of care, or serious contemplations. Thirdly, When the operation of the Medicin is over, you must allay the fury of the animal spirits, and cool the boyling of the bloud and humours: to which ends you may give an Anodynous, or gentle, sleepey Medicin, according to the following Receipts.

Take of the Water of Cowslip flowers ʒij. of Cinamon infused with Barley, of Syrup of Poppies, of each ʒ℥. of Pearl ʒ℥. and make a draught, to be taken when you go to bed. Or, Take of Conserve of red Roses vitriolated ʒij. of Diacordium ʒ℥. of Pearl ʒ℥. of Diacodium a convenient quantity, and make a Bolus, to be taken at night when you go to bed.

The Cure of excessive Purging.

But if so be that notwithstanding ought by omitting this kind of caution, excessive Purging follows upon the taking of such a Cathartick Medicin, immediately the Patient must be put into a warm bed, and treated in manner following. In the first place you must apply either a Plaister of Treacle, or a Fomentation of the decoction of Wormwood, of Mint and Spices, in red Wine, with locks of Wool, dipped in and squeezed: then presently let the Patient take either a Bolus of Treacle of *Andromachus*, or the dissolution of it made in Cinamon water. Besides which, let him drink burnt Wine, diluted with Mint water oftentimes by Spoonfuls. If he be troubled with the Gripes, let him take a Clyster of warm Milk with Treacle dissolved in it; and in the mean time let his outward parts be rubbed with warm clothes, and sometimes bound about in certain parts, to call the bloud outward, and keep it from too great colliquation and flowing into the cavities of the bowels: after which, at Evening, if his strength will permit it, and that the Pulse be strong enough, let him take a Dose of *Diacodium* or *Liquid Laudanum*, with a convenient vehicle.

What is to be done in Symptomatical Lasks.

As to other sorts of excessive Purgations, which, without giving of a Purge, are wont to happen from feteral causes and upon several occasions, and require a Medicin,

Fig. 1^a

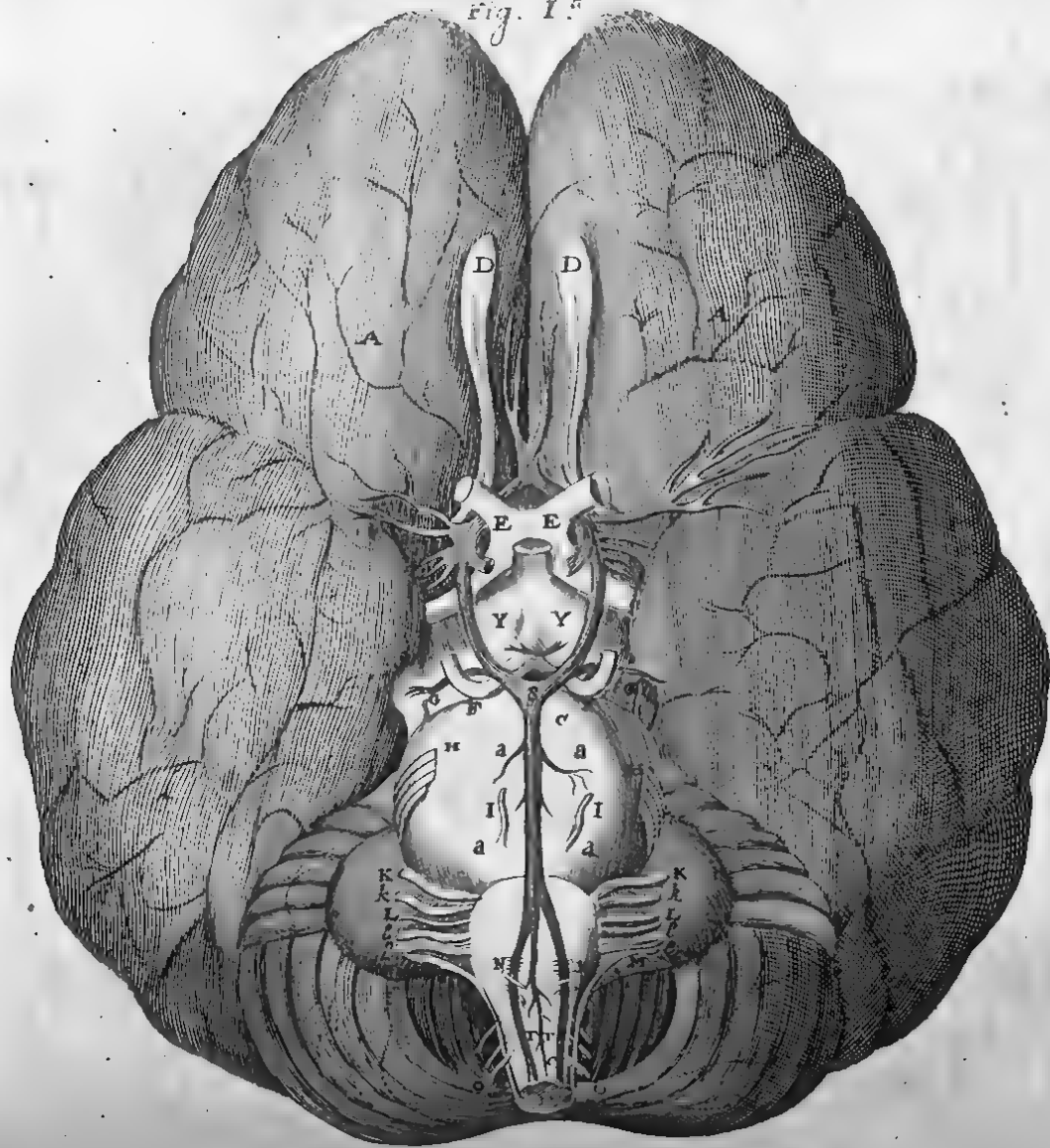


Fig. II^d



de medio S. vid. pag

cin, I say, that many of them being meerly symptomaticall depend upon other Distempers, and that the cure of them is altogether the same as that of those other Diseases whose off-spring, as it were, they are. So if in the Scurvy and a Consumption it hath been usual for the Parties so affected to be troubled with looseness, the method of curing them respecteth not this symptom at all, but the cause of the primary Distemper, which is to be removed. But yet notwithstanding, the looseness of a mans belly (which is ordinarily called either a Diarrhæa [or Lask] or a Dysentery [or Flux]) seems sometimes a Disease of it self; and indeed in this City of London, since this sort of Distemper, which hath used to reign almost every year, is commonly accounted popular, and almost proper to the Place and People, it will be convenient here to inquire into the Nature, Causes, and Cure of it a little farther.

Although the word [Dysentery] in the common acceptation thereof, signifies a *The London Dysentery.* Bloody Flux of the Belly, as a Diarrhæa [or Lask] doth that of the Humors; yet, saving the Etymology, I shall apply that name to this London Disease, even when it is not at all bloody. For I have often and a great while since observed, that there are two *Two sorts of it, a bloody and a watery one.* very different sorts of this same Flux, which almost every year is wont to be so rife here about Autumn, and is commonly called in our language, *The Gripping of the Guts;* in the one whereof the Stools were watery, and as it were, limpid [or clear] with a sudden weakning of the Body; in the other they are bloody, but tolerable; whilst in the mean time the siege is rarely cholerick or phlegmatick (whilst either of these Distempers reign) which shews that the malady is not so obstinate as one would think. Now that you may clearly know both these dysenterical Distempers, as to their formal reasons and causes, as likewise their differences from each other, I think it will be necessary to subjoin in this place an Account of them both as they were observed (and then exactly described) by me some years since when they were rife.

In the year 1670. about the Autumnal Æquinox [or in Autumn, i.e. the Fall of the Leaf] a great many were sick of an unbloody, but a very sharp and dangerous Dysentery. The Distemper came upon them on a sudden, and oftentimes without any manifest cause, and reduced the Patients, by grievous Vomiting, frequent Stools, and those watery ones, in a short time to very great weakness, horrid faintings of their spirits, and destruction of their strength. I knew a great many that though the day before they were well enough and very hearty, yet within twelve hours were so miserably cast down by the tyranny of this Disease, that they seemed ready to expire, in that their Pulse was weak and slender, a cold Sweat came upon them, and their breath was short and gasping: and indeed many of them that wanted either fit Remedies, or the help of Physicians, died quickly of it. This Distemper raged for a whole Moneth, but began to decrease about the middle of *A Description of the former.* October, and before the first of November was almost quite gone. Few at that time had bloody Stools, and not many cholerick ones, but a great many had both Vomiting and Evacuations that were waterish, almost limpid, and in great quantity. And whilst this common Dysentery raged so severely within this City, there was scarce any one sick of it in the Country, or at least above three miles off. Moreover though very many were sick in this place, the Disease did not seem to be infectious, but onely to affect those that were predisposed to receive it. For in the same Family those who conversed with the sick, were no sooner seized by it than such as most avoided their company.

For the cure of this Distemper, no Evacuation availed, but on the contrary, *The Cure of it.* Blood-letting, Vomiting and Purging were always hurtful; but Remedies that were most commonly Cordials, and those very hot; that is, such as abounded with volatile Spirit, and Sulphur or Salt, were helpful; insomuch that Spirit of Wine a little burnt with Sugar, was the popular, and as it were epidemical or universal Remedy; and in such a Dysentery almost always good; though in the other, which was bloody, being indifferently used, it was often found to be dangerous. The Method of curing it, that I took at that time in most cases and with success, and that which I upon the like occasion still use, was as followeth.

Take of Treacle of Andromachus ʒj. or ʒj. ʒ. and take in Bed, drinking thereupon of the following Julap vii. or viii. Spoonfuls, and repeat it every third, or fourth, or fifth hour. *A Bolus.*

Take of Mint water, and of Cinamon infused with Barley, of each ʒiij. of strong Cinamon, of Plague and Treacle water of each ʒij. of Powder of Pearl ʒj. of Sugar chrystallized ʒʒ. *A Julap.*
H 2 mingle

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Part I.

mingle it, and make a Julap. At the same time take a Cake of toasted Bread spread over with Treacle, and dipped into hot brisk red Wine, and apply it to the Stomach, changing it for another ever now and then.

Opiates.

At Evening, if the Pulse and breath be strong enough, let the Patient drink of Liquid Laudanum prepared with Quinces gr. xx. in a draught of Plague water.

Take of Diascordium 3 j. of Liquid Laudanum 5ß. of Powder of Crabs Claws compounded 5 j. of Cinamon water a convenient quantity, and make a Bolus, to be taken when you go to bed.

Those that cannot take Treacle or Mithridate, but find it disagrees with them, may take a Dose of the following Water, or spirit of Treacle, every third hour with the Julap.

A Powder.

Take of the Powder of Crabs Claws compound. of the Roots of Contrayernum and Virginia Creeper of each 3 j. of Cinamon and the Roots of Tormentil, of each 3ß. of Saffron, and of Cocchinele, of each 5 j. and make a Powder. The Dose is 3ß to 5 j.

A Spirit.

Take of Spirit of Treacle Armoniack 3 iij. The Dose is 5 j. with the Julap, every fourth hour, or between times before and after the Doses of the Powder. In the same manner you may use Spirit of Hartshorn or of Spoot. Let your drink be Ale with a Toast and Mace, and Cinamon, sweetned; or burnt Wine diluted with Mint water. Let your food be Chicken broth, or Grewel, or Panada with shavings of Hartshorn, Ivory, Roots of Scorzonera, &c. boyled in it.

The reason of
this Distemper.

Concerning the reason of this same popular Distemper, in the first place let us inquire what may be the principal or immediate cause of it: that is to say, what humour that is which by its offensive and burdensom quality doth so infest the bowels, and irritate or provoke them into expulsive contractions with Gripings, disturbance of the whole body, and a sudden debilitation or weakening of all its forces. Surely no man will think it to be the Gall or Sweetbread juice, or any other that is generated within the passages of the Guts: nor indeed do I believe it to be poured forth from the blood alone into the bowels (as it often happens in the Crisis of a Fever) but I rather suppose (what a man may guess from the sudden languidness, quick fainting of the animal spirits, and weakness of all the parts) that in this Distemper, the best juices of the Body, that is to say, the nervous and nutritive, that is joined and united to the solid parts, are totally vitiated in their temper, and being made fluid, as it were, are melted, and so run into the mass of blood; then immediately from thence (since they are incongruous, unminglable, and unapt to be carried off by Urin or Perpiration) they are transferred through the *Vasa cæliaca* [Belly Vessels] toward the Stomach and Guts, and there flowing out at the numerous thickset mouths of the Arteries, cause these horrid symptoms of a Dysentery. Moreover it is likely that the very blood also being mixed with a deluge of other humours is melted at the same time, and being dissolved in its temperament, poureth out its melted parts with its other dregs into the cavities of the Bowels.

It arises first
from the vitia-
tion of the ner-
vous juice.

Most certainly there is no other reason why all the motive fibres should be so suddenly weakned, and the whole Body languish, but that the humour that actuates or enlivens them, and in which the animal spirits reside, forsok them totally, and flowed out; and indeed we suppose it to flow out, in as much as being vitiated in its temper, it not onely molested the containing parts like sowering Milk, but puts them upon shriveling themselves with such a motion as throws that Humour out. Besides, I almost always observed that this Distemper began with a chilness; but not such as was followed with the heat and burning of a Fever, because the blood, although in it self but little vitiated, yet being almost overwhelmed by a Flood of other juice that came in upon it, could not recover or recollect it self so far as to boyl up feverishly or into a Crisis. For this reason Cordials (but none except the strongest and hottest) as also hot Waters and Spirits, Treacle, Mithridate and the like were of use: that is, such whose particles being extreme active, would repel or drive back the Humours that were ready to flow out, whilst they easily get into the mouths of the Splenchnick [or Bowel] Vessels; and likewise such as gradually insinuating into the mass of blood might strengthen and excite it to a fermentation and a motion to sweat; whereby it might not onely recover its former temperament, but also retort or throw back in to the habit of the Body what ever was carried into it that was disagreeable.

So

So much for the immediate or conjunct cause of this distemper, the more remote are original or antecedent, and manifest or evident; the former of which denotes from what occasion or original this kind of morbid and infectious disposition proceeds, and the latter, through what causes it the sooner breaketh forth into a Dysenterical Distemper. As to the former, this Distemper, because it rages most commonly in Autumn is ascribed by many to the immoderate eating of Summer, or rather Autumnal Fruits; which indeed I could easily admit to be partly the cause of a Bloody Flux; nay, I have reason also to think that in some persons the aforesaid Disease had from thence a kind of seminal origination. But that this is not the total and adequate cause of that Distemper is plain even from hence, because many Inhabitants of this City, who abstain from Fruits, or use them more cautiously, were sick of an unbloody Dysentery or Flux, whilst it was Epidemical or rife; and others that eat a great deal of Fruit in the Neighbouring Villages, were altogether free from this, though troubled with other Fevers, but without any Gripings or Fluxes. For I have oftentimes observed (what happened also in this year) that after an exceeding hot and dry Summer, an Epidemical and unusual Fever hath been very rife at Autumn in many places of England, and that at the same time in London very few have been sick of that Fever, but a great many of the Dysentery or Flux: the reason whereof seems to be, that since our Bodies, by reason of the foregoing unseasonableness of the Summer, are disposed for autumnal Fevers, those, in this smoaky thick Air, are the rather determined to this kind of Distemper. For when transpiration is hindered, the corruptions of ill Humours, being unapt to make their passage through the pores of the Skin, settle on the inside, and there breaking forth out of all the Arteries at once, are the cause of these horrid effects in the Bowels.

Phar. Rat. Part. I.
The remote causes of it.
Why it is Autumnal and Epidemical.

The first causes of it are, 1. The thicknest of London Air.

Moreover the Summer, as it is more or less hot or cold, moist or dry, maketh a great alteration in the Humours of our Bodies, as it doth also in all fermentative juices, and changes them oftentimes from their natural habit into a sharp, sower, or adust temper. And then some years this change is impressed chiefly upon the blood, though in other years it is more upon the nervous juice. From the former most commonly follow Autumnal, or acute, or intermitting, but very severe Fevers. From the latter arise irregular and unusual Fevers; in which very dangerous diseases in the Brain and Nerves ensue, and are very rife without any great heating of the Blood, or Crisis of the distemper. Moreover in this sort of Distempers, either the dregs of the nervous juice which gradually and insensibly decays, being slowly and by degrees without any critical turgescence, or swelling gathered together, and remaining for a long time within the containing parts, produce Fevers in the Nerves with sluggishness and dizziness (such as I formerly described in my Treatise called *Spasmologia* [or of Convulsions:] or the corruptions of that juice which is suddenly and much altered in its temperament, being more fierce and active, swell with a kind of fluidity, and run over out of the fibres, the nervous and solid parts on all sides into the mass of blood, and from thence flowing presently into the cavities of the Bowels produces this unbloody kind of Dysentery, such as is here just now described. And indeed that this same watery Flux proceedeth from a depravation and colliquation or melting, as it were, of the nervous and nutritive juice, rather than of the Blood it self, is evident, not onely from the sudden and great dejections of the Spirits (which such an effusion of more blood could never cause) but likewise from hence that those who are sick of this Disease, are not troubled with heat or droughth in their mouths, or roughness on their tongues, but well endure the hottest Medicins; and as soon as by the application of such Medicins the peccant or offending humour is inverted, and retorted into the habit of the Body, they quickly recover without either Fever, wakening, or any other consequences of corrupted blood.

2. The unseasonableness of the Year.

As to the evident causes of this Distemper I need not say much, since the constitution of the Year is such, that through the malign influence of the Air or Heavens, the juices that are generated from the blood, that is to say, the nervous and nutritive do degenerate from their genuine temper, into another nature, which is offensive, and as it seems, sower, and consequently dysenterical, or inclined to a Flux. Errors in Diet, and other unnatural things at that time committed, do cherish and augment that ill disposition, and bring it much the sooner to a fulness that swells even to evacuation. It will not be worth my while here to recount particularly all the manifest causes and occasions by which they are produced, but rather let us go on and shew the nature of that other, to wit, the Bloody Dysentery or Flux.

The evident causes of it.

Phar. Rat.
Part I.The Description
of it.

Of the Bloudy Flux.

The Fall of the Leaf in the Year 1670. (which was famous for the Unbloudy Flux just now described) was attended by a Winter that was exceeding cold, and such an one as scarce any man living had ever known: nor did the following Summer participate less of the other extreme; being extreme hot and dry; and in the Autumn after that there was an Epidemical or universal Fever that raged almost all over *England*. This Fever, observing the form of an intermitting one, had Fits sometimes every day; and sometimes every other day, but with none or onely very little cold, though with excessive heat; which lasted for many hours together, and many times above a day and a night, but hardly passed into Sweat, or if it did, it was but in some parts, and that oftentimes interrupted too, without any remission after it. Those that had this Distemper were presently taken with an unusual languidness, with waking, dizziness, and oftentimes the Head-ach very intolerably: and the disease which was seldom or never capable of a perfect *Crisis* [or Judgment of Physicians] continued very long, and oftentimes having fixed an incurable Malady in the Head or Brest, ended in a Distemper that was sleepey or consumptive, and many times deadly. I formerly described a Fever that was like this in my Treatise called *Puretologia* [or an Account of Fevers] together with the Nature and Cure of it; before which also went the like constitution of the Year.

An irregular
Fever uses to
be at the same
time with this
in other parts
of England.

But whilst this Fever raged almost in all parts of the Country, through the Villages and Towns, there was a Flux at *London* which was really a Bloudy one; and not onely so, but extraordinary sharp and severe, insomuch that it tumbled a great many People suddenly into their Graves. When this Distemper came first upon a man, he most commonly voided Bloud very plentifully and frequently with pains and gripings in the belly; long watchings with feverishness, and extreme thirst used to afflict him; yet their strength continued still so firm, that those who were so affected, after they had been sick about a Week, and gone to Stool almost twenty times every day, could rise out of their Beds. Though the bloudy evacuations seemed terrible, yet the Patients did not die suddenly, but continued several Weeks, yea sometimes Moneths, voiding Bloud every day in great quantity; and at length, when the Distemper growing still worse and worse, tended to their destruction, there appeared before their death other symptoms, and especially watchfulness, roughness of the tongue and mouth, thirst, and sometimes destructive Thrushes; and if the Flux were restrained, or stopped unseasonably, or sooner than it should have been, those symptoms broke forth the sooner, and signified great danger of death. Poor People that had for a long time been used to an ill sort of Diet, and such also as had either no care taken of them at first, or at least all remedies misapplied, oftentimes died, or with great difficulty recovered: On the other hand, those that were happy in a better habit of Body, and trusted to seasonable and proper Physick, many times escaped. Moreover the Distemper it self, though it were Epidemical, or universal, yet it was not equally malignant in all persons, but seemed in some more mild, and in others more severe; that is, the Flux at the beginning was sometimes gentle, and not unlike to a Diarrhea, or Lask, in which tho the Stools were frequent, yet being without pain, or much bloud, they were easily, and sometimes quickly cured. But sometimes again this Distemper seemed very sharp and horrid, that is to say, when the bloud was poured forth in great quantity, with gripes and extreme torment. But in some People the Stools were liquid and died with pale bloud, like the washings of raw flesh, whilst in others they were thicker, full of bloud, and also stuffed with a whitish slime, as likewise very often with bits of membranes. The seat of pain being sometimes higher and sometimes lower, shewed that the small Guts in some, and that in others the bigger were the more affected.

The way to cure
it.

The way to cure this Distemper, with remedies that I found helpful to very many People, was as follows.

First, In some measure to stop or moderate the Flux.

A Bolus

Take of Treacle of *Andromachus* \mathfrak{z} j. of liquid Laudanum prepared with Quinces gr. xx. and make a Bolus, to be taken when you go to bed.

An Electuary.

Take of Conserve of Red Roses vitriolated \mathfrak{z} ij. of Treacle of *Andromachus* \mathfrak{z} j. of Powder of the Roots of *Tormentil* and *Contrayernum*, of Pearl and prepared Coral, of each \mathfrak{z} j. Syrup

Syrup of dried Roses a convenient quantity, and make a Confection, to be taken every fourth or fifth hour in the quantity of a Chestnut, drinking thereupon $\frac{3}{4}$ of the following Julap. Phar. Rat. Part I.

Take of Mint Water, of Balm, and of Cinamon, Barly Water, of each $\frac{3}{4}$ iv. of Treacle and Plague Water, of each $\frac{3}{4}$ ij. of Pearl $\frac{3}{4}$ j. of Sugar $\frac{3}{4}$ j. mingle it, and make a Julap. A Julap.

After one or two days give this purging, and yet strengthening Potion.

Take of Rhubarb shreded $\frac{3}{4}$ ij. of yellow Myrobalans shreded $\frac{3}{4}$ j. β . of Red Sanders and Cinamon, each $\frac{3}{4}$ j. Make an infusion all night in Plantaign Water and Cinamon infused with Barley, of each $\frac{3}{4}$ ij. β . Squeeze it well and put to it of strong Cinamon Water $\frac{3}{4}$ ij. β . and make a draught. A gentle Purge.

Every Evening, and in some cases also in the day time, I used to give a good Dose of Laudanum; nor did I ever know that this Medicin was hurtful to any one that was troubled with a Dysentery or Flux; whether it were that the stupifying quality of the Medicin was overpowered, and as it were, tamed by the more acid juice of the Stomach, or rather, that the particles thereof being transmitted to the blood, are thrown out again presently from thence along with the Bloody Stools, that they may not affect or hurt the Brain. Opium.

Those that cannot take, or do not find it convenient to take the aforementioned Confection, let them take in stead of it this following Powder.

Take of Red Pulvis Pannonicus, or Hungarian Powder $\frac{3}{4}$ j. of Contrayernum Root $\frac{3}{4}$ β . and make a Powder, dividing it into three parts, of which take one part in any Liquor. Or, Take of Bale Armeniack, an Alexiterium (that is, impregnated with the juices of the leaves of Tormentil, Bistort, Red Roses, &c. and dried in the Sun) and of Contrayernum Root, of each $\frac{3}{4}$ j. of Pearl, of Red Coral, and the whitest Amber, each $\frac{3}{4}$ β . Make a Powder. The Dose is from $\frac{3}{4}$ ij. to $\frac{3}{4}$ j. A Powder.

Take of Radix Caryophyllata or Arvens root, of Scorzonera, of each $\frac{3}{4}$ j. of Tormentil, Bistort An Apozeme, or one Contrayernum, each $\frac{3}{4}$ ij. β . of Harts horn burnt $\frac{3}{4}$ ij. of Shavings of Ivory and Decolion. Harts horn, each $\frac{3}{4}$ ij. of Cochinele $\frac{3}{4}$ β . of the Flowers of Red Roses $\frac{3}{4}$ ij. and boil them in a convenient quantity of Spring water to two Pints. About the time that you have so done, put to them, of the Conserve of Red Roses $\frac{3}{4}$ ij. and to the clear straining of it add of Plague water $\frac{3}{4}$ iv. The Dose is $\frac{3}{4}$ ij.

For allaying the Gripings in the Guts, and to cure the gnawings in them many times Clysters are of good use.

Take of the Decoction of the tops of Hypericon or St. Johns Wort, with Sheeps Feet, or the Mesentery of a Sheep $\frac{3}{4}$ viij. or xij. of Treacle of Andromachus $\frac{3}{4}$ ij. of Oil of Hypericon $\frac{3}{4}$ j. β . and make a Clyster. A Clyster.

I here omit many other Forms of Medicins that are extant every where in the Books of Practice, and which every one upon occasion may and ought to prescribe. We have nothing else to do but to enquire a little into the reason of this Distemper which was Epidemical, or rather popular and peculiar to such a place.

From what I have already said, it is evident enough that the Dysentery or Flux (neither the Unbloody, nor the Bloody one) doth not proceed meerly from the sharper matter which is contained in the Guts. Moreover as that other Distemper seems to have had its original from the flowing of the Nervous Liquor and Nutritive Juice, that was degenerated, so this had it chiefly from the corruption and vitiation of the Blood; and therefore as there was elsewhere a Distemper of the Nerves which was contemporary of that Endemious or popular malady in this place, so when a Bloody Flux afflicted the Londoners, an intermitting Fever much like to a Semitertian (as it is described by the Physicians) infested all England besides. And indeed it will be easie enough to conceive, that since the Blood being roasted, as it were, with the Summer heat, and consequently about Autumn apt to rise into feverish effervescences [or boilings] and, like Wines, into immoderate Fermentations, whereby they are purged, if

Phar. Rat.
Part I.

it cannot carry off the degenerated and excrementitious particles (by reason that Transpiration is hindered in a thick Air) the ordinary way by Sweat, that being still in a boyling heat, it transmits them toward the Guts, and endeavours to throw them out through the mouths of the Arteries that are there thick set and much wider than the pores. But then if the incongruous dregs, or morbid corruptions of the Blood when degenerated, being thoroughly mixt with it, and intimately confounded in it, cannot be easily separated or drawn off; it therefore being big and oppressed with this load, is very much streightned in its circulation, as it passes through the smaller Vessels; and consequently about the inward surface of the Guts, where the coats of the Arteries are more tender, and the mouths wider, the Blood that begins there to swell, and at the same time is thickened by the heterogeneous particles, wherewith it is filled, being apt to coagulate, doth easily break forth; and seeing it cannot separate and cast forth its dregs, it pours forth some portions of it self that are most offensive to them.

Three things
concur to cause
this Distemper.

Wherefore to cause a popular Dysentery, these three things must needs concur; that is, In the first place the mass of Blood must be vitiated, through the unseasonableness of the Year, whereby it may be inclined to feverish effervescencies [or boylings] either on its own accord, or occasionally. And that is the reason that when this Distemper is at London, an irregular Fever uses to rage in other places. Secondly, The dregs and corruptions of the Blood, so boyling and degenerated from its temper, are so intimately mixt and confounded with it, that they cannot be easily separated, or be thrown out either by Sweat or Urine of a sudden. Whereupon I have observed, that the Fever which was contemporary with this Dysentery, was always of a long continuance, and very hardly capable of any true judgment; as also that the Fits of it scarce ever ended in a remission. Thirdly, Add to these the stoppage of the Pores (which determines the aforesaid dispositions into a Bloody Flux) which is caused by the smoky and thick constitution of the Air: For this directeth the purgative boyling of the Blood toward the Guts; where seeing the dregs thereof cannot be separated and easily parted from the other mass of Liquor, it self spontaneously flows forth by portions that are most infected, and consequently ready to be extravasated or thrown out of their Vessels.

This Distemper
is either more
mild or malignant.

By this means the ordinary London Dysentery, which is not very malignant, is usually produced; which though it be presently horrid or dreadful by reason of its bloody Stools, and most commonly of a long continuance, yet it is not very contagious, nor often mortal. But this Distemper also being sometimes virulent, and as it were pestilential, kills a great many People, diffusing its infection very largely by contagion. Moreover in such an habit of the Blood, the parts of it being touched with a kind of malignity, begin to be corrupted as in a Plague, and ought immediately to be separated from, and thrown out of the rest of the mass, lest the whole should be thereupon infected: which portions, notwithstanding, being thicker than ordinary, and consequently apt to be purged forth through the Belly rather than through the habit of the Body or by Urine, are carried by the passage of the *Arteria Celiaca* and *Mesenterica* into the coats of the Guts; where they do not easily part from the rest of the blood, but partly breaking out of the Vessels, cause bloody Stools, and partly fixing in the membranes of the Guts, beget in them either inflammations or ulcers, or sometimes also mortifications, which occasion sudden destruction.

So much of the causes (both immediate and antecedent) of a Bloody Flux, as it uses to be the peculiar Distemper of this place about Autumn. As to the manifest causes or occasions that bring the morbid disposition the sooner into act, they are to be reckoned chiefly an ill course of Diet, and the pravity or badness of the Air that we breath in: and that is the reason that in all Countries it is very common in Camps among Souldiers, and in Prisons among Captives, by reason of the stench of the place and their ill diet. Moreover many other errors in unnatural things ought to be referred to this head, of which I have no leisure, nor were it worth while in this place particularly to discourse.

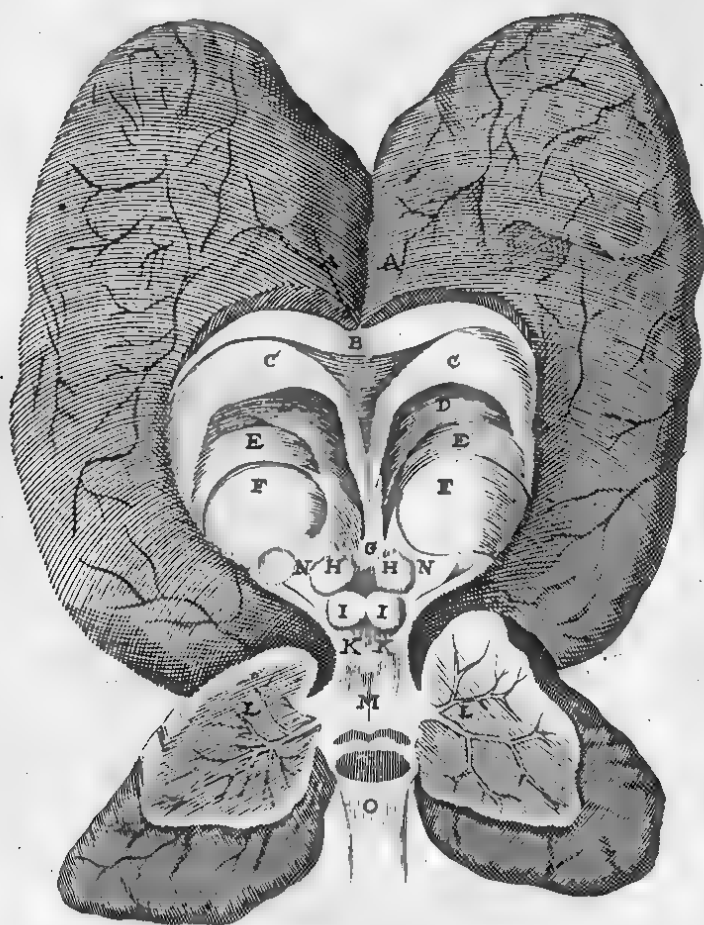
The ways to
cure it.
Two in respect
of the Blood;

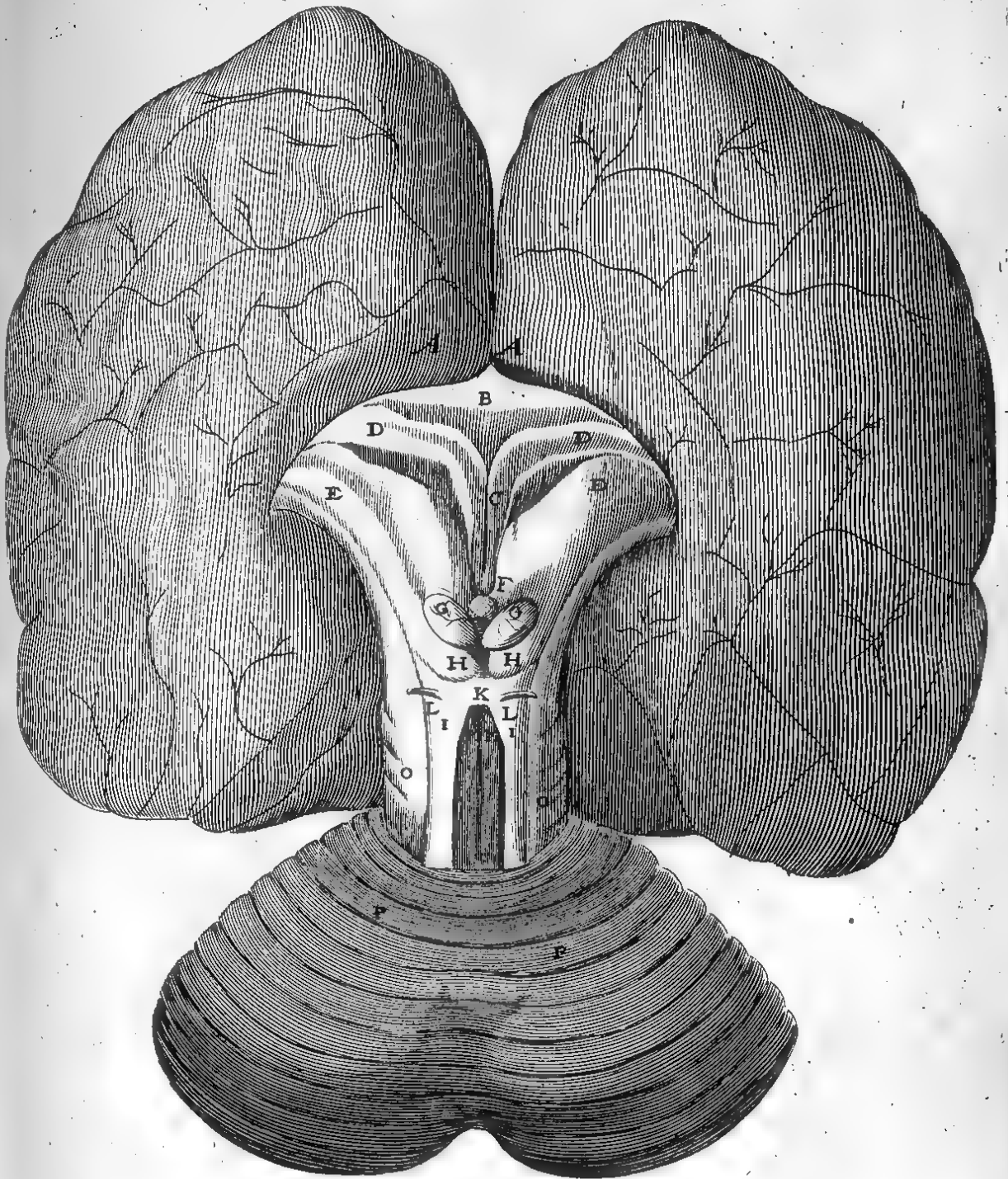
The chief and primary means into which the method or practice of Curing this Distemper, which is before shadowed out, may be resolved, are four; that is to say, two in respect of the Blood, and as many in respect of the Bowels. And first, as to the Blood, it will be necessary to drive forward not onely the dregs and corruptions thereof (that would go inward) outward toward the habit of the body, to the end that they may exhale by transpiration, but also to dissolve the coagulations of it, and restore its temper as much and as soon as possible. The former of which is performed by Sweating Medicins, and the latter by convenient *Alexipharmica*, or Medicins that resist and rectifie corruption. Secondly, as to the Bowels, the painful sense of the

And two as to
the Bowels.

nervous

Fig. III.





nervous fibres ought to be allayed, as likewise the irritation or provocation of the fleshy ones, by which they are excited to expulsive convulsions, and also the mouths of the Vessels ought to be shut, lest they pour forth the blood and humours into the passages of the Guts. The former of these is usually effected by Opiates, and the other by Remedies that are styptick or astringent; besides which you ought to take care of the most urgent symptoms and evil dispositions that are usually incident to this Distemper, of which sort in the first place are a Fever with Thirst and Watching; Gripings of the Guts, and sometimes Gnawing, Inflammation, and Ulcers.

It will not be necessary to insist upon these primary Indications, particularly and successively, but it is my business to comprise them all together, and set them forth at the same time. Wherefore the Receipts of such Medicins ought to comprehend Remedies of several kinds, to wit, *Alexiteria*, or Medicins to expel or rectifie infection; *Stypticks*, or astringent Medicins; *Diaphoreticks*, or Sweating Medicins; and *Opiates*, or sleeping and resting Medicins. But because it will not be easie to reduce these Medicins into a certain Method, or into precepts that may suit with so many constitutions, I therefore thought it better to give you at present some Examples of Dysenterical Cures, done in the Autumn of the Year 1671. when this Distemper raged very much.

A young Gentleman about 25 years of Age, of a sanguine temper, and a constitution formerly very hale, about the first of October, fell into a Dysentery without any manifest cause; and though immediately from the first day his stools were plentiful and bloody with Gripings, yet being still strong and well in heart, he deferred taking of Physick till the third day; at which time I was sent for late at night, and prescribed him this following Bolus.

Take of Treacle of Andromachus 3j. of Liquid Laudanum prepared with Quinces ʒj. mingle them, and let the Patient drink thereupon a small draught of the following Julap.

Take of Water of Tormentil, Mint, and of Cinamon, Barly water, each ʒ iv. of Treacle and Plague water, each ʒ ij. of Pearl 3j. of Sugar 3j. make a Julap.

Then every third hour he took of the following Electuary about 3j. ʒ. with the same Julap.

Take of Conserve of Red Roses ʒ ij. of Treacle of Andromachus 3j. of the Powder of the Roots of Tormentil, Contrayernum, Pearl and Coral prepared, each 3 ʒ. of Syrup of Rhead Poppy, a convenient quantity.

With these Remedies the fury of the Distemper was soon taken off, so that in four and twenty hours he had scarcely more than 6 or 7 stools, and such too which did not appear very bloody as before, but full of little bits of flesh, as it were, pieces of the membranes: which no question was occasioned by some small portions of the hairy veil which were gnawed off: every Evening he took Opiates with Laudanum.

The fifth day that he was sick he took the following draught:

Take of Rhubarb shredded ʒ ij. of yellow Myrabolans ʒ j. ʒ. of yellow Sanders ʒ ʒ. of Cinamon pulverized ʒ j. of Salt of Wormwood ʒ ʒ. make an Infusion all night in Plantaign Water and Cinamon, Barly Water, of each ʒ ij. ʒ. to the straining of which, add of strong Cinamon water ʒ ij.

A Purg.

He purged three or four times, whereby he found ease, and the next day his Fever being abated he was better; in so much that seeming to grow well again, he eat flesh; but by that means he fell into a relapse, and the Dysentery immediately returning with a Fever, was more severe than at the beginning: at which time, seeing the former Medicins began to be nauseous to him, I prescribed in manner following.

Take of the Powder of the Roots of Tormentil, Contrayernum, and of the Bolus called Alexiterium, each 3j. of Pearl, red Coral prepared, and the whitest Amber, each 3 ʒ. and make a Powder. The Dose is ʒ ʒ. in ʒ ij. of distilled water.

A Powder.

Take of the Tops of Cypress and Myrtle, each iv. handfuls, of the leaves of Meadowsweet, Pim-

A Distilled Water.

Phar. Rat.
Part I.

Pimpernel, and St. Johns wort and Aven's, of each iij. handfals, of the Roots of Tormentil and Bistort; each 3 vj. of the Flowers of Red Roses iv. handfals, of Berries of Cbermes 3 iv. of Cinamon and Mace, each 3 j. when you have cut them and bruised all to pieces, pour to them of red Florence Wine, and of red Rose water, each iv. Pints; distil them with the common Instruments, and let the whole Liquor be mingled and sweetned when he takes it with Syrup of Corals.

He also took three or four times a day of the following Decoction 3 iij. ort iv.

A Decoction.

Take of Aven's root and of Scomzonera, each 3 j. of Tormentil 3 ij. of Harts horn burnt and pulverized, 3 vj. of shavings of Ivory and Harts horn, each 3 ij. of the tops of Hypericon one handful, of Flowers of red Roses, and of Balaustians, each one small handful. Boyl them in spring water till three Pints sinks to two, add at the end of Lisbon red Wine 3 iv. of Conserve of red Roses 3 iv. Let them boyl close for an hour, and then strain it through Hippocrates Sleeve.

He every night took of Liquid Laudanum 3 j. in 3 iij. of the Dysenterical water just now described, with Syrup of Clove Gilliflowers.

A Decoction for
ordinary drink-
ing.

For his ordinary Drink he had a Decoction of *Harts horn burnt, with Barley, & Crust of Bread, Mace and Cinamon, of which half a pound was put to a Pint of new Milk.*

The purging Infusion was taken again, by the help of which and the former Remedies, within ten days the Fever went off, and the Dysentery abated very much; which, though it were without Gripings, or much bloud, yet it still continued with small pieces of flesh, bits of the Membranes, and phlegm or bloody slime which he daily voided.

Therefore to strengthen and heal the Guts, the following Remedies were given.

A Clyster.

Take of the tops of Cypress, of the leaves of Vinca Peruviana, or Periwinkle, and Mouse-ear, of each one handful, of the Flowers of red Roses two small handfals: boil them in the Broth of Sheeps Guts. To a Pint of the straining thereof, add of Oil of Hypericon, St. Johns wort 3 ij. of Honey of Roses 3 j. 3. mingle it for two Clysters, of which the one was given in the morning, and the other at 5 of the Clock in the Afternoon.

A Plaster.

He wore a Plaster of Red Lead and Paracelsus upon his Belly; and took also every day twice; of Plantain juice squeezed out with Water of Scordium or Water Germanander and Plague Water, 3 iij. and likewise eat each day a Quince scooped, filled with the Powder of Olibanum, Mastick, and Balsam of Tolu, and roasted under the Ashes.

A Quince
made a Medi-
cin.

Having used these Remedies constantly, he perfectly recovered in a Moneths time.

The Second Story.

About the same time another strong young Man fell into a terrible Dysentery; and from the very first day his stools came from him very fast, and mighty bloody, with pain and gripings; as likewise an extreme Fever with excessive vomiting, thirst and watching did afflict him; but when by his taking of Opiates these symptoms were somewhat mitigated, he was taken strait with a degree of madness, called a *Pelirium*, and a swimming in his Brains, with an intermitting pulse, and horrid numbness, in as much as the malignant matter, being kept within, flowed presently into the Brain and Nerves; but these indispositions were soon over, as often as the flux and vomiting returned. The fifth day he vomited a gory matter, and complained of the great pain and torture in his stomach as if he had had an ulcer in it; in so much that I really thought there might be some inflammation, or ulcer there, as it usually happens about the Guts: but by taking of gentle Broths, his vomiting and gripings in the stomach were soon allayed, though the Flux in the mean time increased. He took that night of *Diadadium* 3 j. with small Cowslip and Cinamon water, of each 3 j. 3. by which Medicin he was so much relieved, that he continued for a night and a day pretty well, without vomiting or pains, and onely a few stools, with a tolerable good pulse and frequent slumbers; but the night following, though he took the same Opiates again, yet the Flux returned upon him very frequent and bloody. The day after he took Infusion

Infusion of Rhubarb, with Myrabolans, Red Sanders, and Cinamon. He often voided cholerick matter, extreme sharp and altogether unbloudy; and then that Evening he took of *Liquid Laudanum* prepared with Quinces *gr. xxv.* in a Spoonful of Cinamon-barley Water, after which he had moderate and more quiet rest. Afterward being averse to any more Physick, he onely took an Opiate every Evening, sometimes one and sometimes another; and in a short time recovered.

Phar. Rat.
Part. I.

S E C T. IV.

C H A P. I.

Of Purging by Urine, and of Medicins that provoke it.

I Have formerly treated very largely concerning the Nature and Composition of Urine, as likewise of the Offices thereof, whilst it is a part or dreg of the Blood, together with its ways of separation. I shall now in this place observe, that there is some affinity between that and Sweat; in so much that they oftentimes change turns, and the matter of the one is conveyed forth at the Emunctories or Drains of the other. For perspirations through our skin, if they are too strong and impetuous, take away with them very much of the serous liquor that was designed for the Reins or Kidnies, and turn it into Sweat; so on the contrary, when the Serum is poured through the Kidnies in greater quantity than ordinary, it calls in to it a great many small particles, such as used to breath through the skin, and involving them in its torrent carries them off by the passages of Urine. Hence it comes that Diaphoretick and Diuretick Medicins [or such as provoke Sweat and Urine] are very nearly related as to their use, and sometimes reciprocal [or such, as that one may be taken for the other.] By both of them, when taken, the mass of Blood is dissolved or precipitated, or at the least compelled to divide into several parts, to the end that the Serum or Whey, being separated from the rest of the Blood, may be thrown out at the most easie passage.

The Relation
between Piss
and Sweat.

Although the immediate matter of Urin flows onely from the blood and be carried to the Kidnies and Ureters solely by the conveyance of the emulgent Arteries; yet it often uses to have many mediate fountains and those very different too; which may be distinguished in a threefold respect at most; that is to say, Piss is either a meer excrement, and a watery part of the blood when it grows stale; which having circulated with it for some time, gains a lyish tincture from the saline and sulphureous particles that are incorporated with it. Or, Secondly, It is that dilute part of the Chyle, whilst it is yet crude, which being poured into, mixed with the blood in great quantity, is separated again before it be infected with the tincture, and makes the Urin extraordinary clear. Thirdly and lastly, The matter of the Piss is often great part of it a kind of Water, poured, or as it were exstilled out of the blood into the solid parts, glandules, and lymphæducts, which being copiously gathered there, and afterwards of its own accord, or occasionally gaining a fluidity, and running out of its receptacles through the lymphæducts [or water-passages] is carried back into the Veins; from whence with a swift motion, going through the Arteries unmixed, it is discharged into the Kidnies; and because no particles of Salt or Sulphur are mingled with it by reason of its short stay in the blood, the Urine therefore is limpid or clear, as water. The Urin of men in health does most commonly partake in some measure of each of these, and according as this or that, or any other matter prevails, they appear more or less, or not at all died. The Serum whencesoever it comes, when mixed with the blood, is separated again from it in its circulation, in divers places, but especially in the Reins. For the blood boiling up, and being very much rarified within the Arteries, must of necessity cast off its serousness, and divert it some other way, that being separated thence it may pass into the Veins. Now this, as it is performed in all parts of the whole Body, so it is more copiously and in a peculiar manner within the Veins. But though People generally know and acknowledge that the separation of the Serum is made in this place, yet there are great controversies among them about the ways whereby it is performed, whilst some say that the serous Liquor is attracted to the Reins; others, that it is onely strained there; and others guess that there

what the matter of urin is, and from whence it comes: It is threefold.

How the Serum is separated from the blood.

Phar. Rat. is a kind of ferment which lodges in the Reins, by the mixture whereof the whey of the blood, like that of Milk, is dissolved and precipitated by the acid Renner, as it were: and indeed the rancid and ungrateful smell and taste of this Bowel seem to argue that the thing is in some measure so. Before we can determine any thing certainly concerning the virtues and operations of Medicins that provoke Urine, we must of necessity explain this doubt, to wit, what is done in the Kidnies by the ordinary course of Nature, and what in the mass of blood, for the separation of the Serum.

Part I.

The Serum is not attracted to the Reins.

And first of all, that the Serum is not attracted to the Reins, needs no proof among Philosophers, since similar attraction is of late days quite exploded by most Virtuosoës, and all local motion declared to be performed by impulse onely. And truly, as to the present affair, to all those that are acquainted with the circulation of the blood, it is very manifest, that as the blood, so also the Serum of it, which is its constant companion within the vessels, is driven forward toward the Reins by the meer motion or impulse of the heart. But in order to shew you whether it be there separated by percolation onely, or also by a kind of precipitation it seems necessary to inquire a little more accurately into the Anatomy and use of the Reins.

The make of the Reins, &c.

Of the Structure or Make and Use of the Reins, since many, Ancient and Modern Authors have given us several accounts, the famous *Bellinus* hath most accurately delivered the Anatomy of them. Indeed every one may easily perceive that the blood is carried to the Reins by the emulgent arteries, and back by the veins. This the Laws of circulation and ocular testimony do manifestly declare. But in what places, through what conveyances, and by what art the Serum is separated in the Reins from the Blood, and discharged into the *Pelvis* [or Basin] was long unknown to the most diligent inquirers; till the aforesaid Author by great good hap found out that the substance of the Reins was neither a *Parenchyma* [or stuffing] as that of the Liver or Spleen; nor fleshy fibres, as the bodies of the heart and muscles, but an heap of membranous small pipes; and that the Serum being carried through those passages, though very extraordinary small ones, from the circumference of the Kidnies to the center of it, was exsilled into the *Pelvis* or Basin. For the emulgent Artery being divided first into greater branches, and then into lesser, and at last into very small sprouts, conveys the blood every way all over the outmost surface of the Kidney; and when the blood boyling up and being rarified, flows out at the mouths of the Arteries, whilst the bloody part, that is to be carried back, is received into the Veins, the serous or wheyish part gets into the exceeding narrow pores of those small pipes, which are impervious [or unpassable] to the blood, and flowing through them every way toward the *Pelvis*, is discharged into the *Substantia papillaris* [a part of the Kidney so called] out of which it drops by little and little into the *Pelvis*.

The use of them.

The Serum is separated by percolation.

From what I have said, it is manifest that the Serum is separated from the Blood by a kind of percolation in the Reins, after the same manner as when it is discharged in many places out of the Arteries into the Glandules to supply matter for tears, spittle, sweat, and other excrements. But I am also of opinion that this is likewise performed in some sort by dissolving of the Blood, which is in its own nature thick and apt to curdle, whilst it passes through the Reins, is very much dissolved and attenuated by the leyish ferment of this part; in so much that the serous liquor separates from it more easily. For the Piss being impregnated with a Saltness, whilst it continually washes through the very streight passages of the Reins, affixes on them saline particles, and consequently infects them with a kind of leyish odour or tincture, with which when the blood is influenced as it passes through those parts, it is kept from thickening, still fluid, and apt to divide into several parts by percolation; as in like manner Milk is preserved from curdling by throwing Salt of Tartar into it. Yea the blood itself, though out of its Vessels, it presently uses to grow thick and curdle, yet if you pour into it a quantity of Salt of Tart or Sal Armoniack, it remains fluid. The ferment therefore in the Reins doth, as it is commonly supposed, precipitate the blood, but keeps it in such a state as that it may itself the more freely circulate, and the Serum of it be separated in a due quantity by percolation. And indeed that the Reins are impregnated with such a leyish ferment, is sufficiently manifest from the flesh of them, when prepared for eating; in that it hath from thence a very rank and ungrateful smell and taste.

The Reins have a ferment in them.

Part of the nutritive juice is carried away thorow the Reins with the Serum.

Whilst the Serum is separated on this manner in the Reins, partly by fusion and partly percolation, not only the bloody part, but also most part of the nutritive juice too, escaping through the narrow pores of this same Strainer, is remanded with the blood through the veins, whilst in the mean time the serous liquor itself, being impregnated with a saltness, not onely in the mass of blood, but also by the ferment of the Reins, gleets down through

Fig. V.

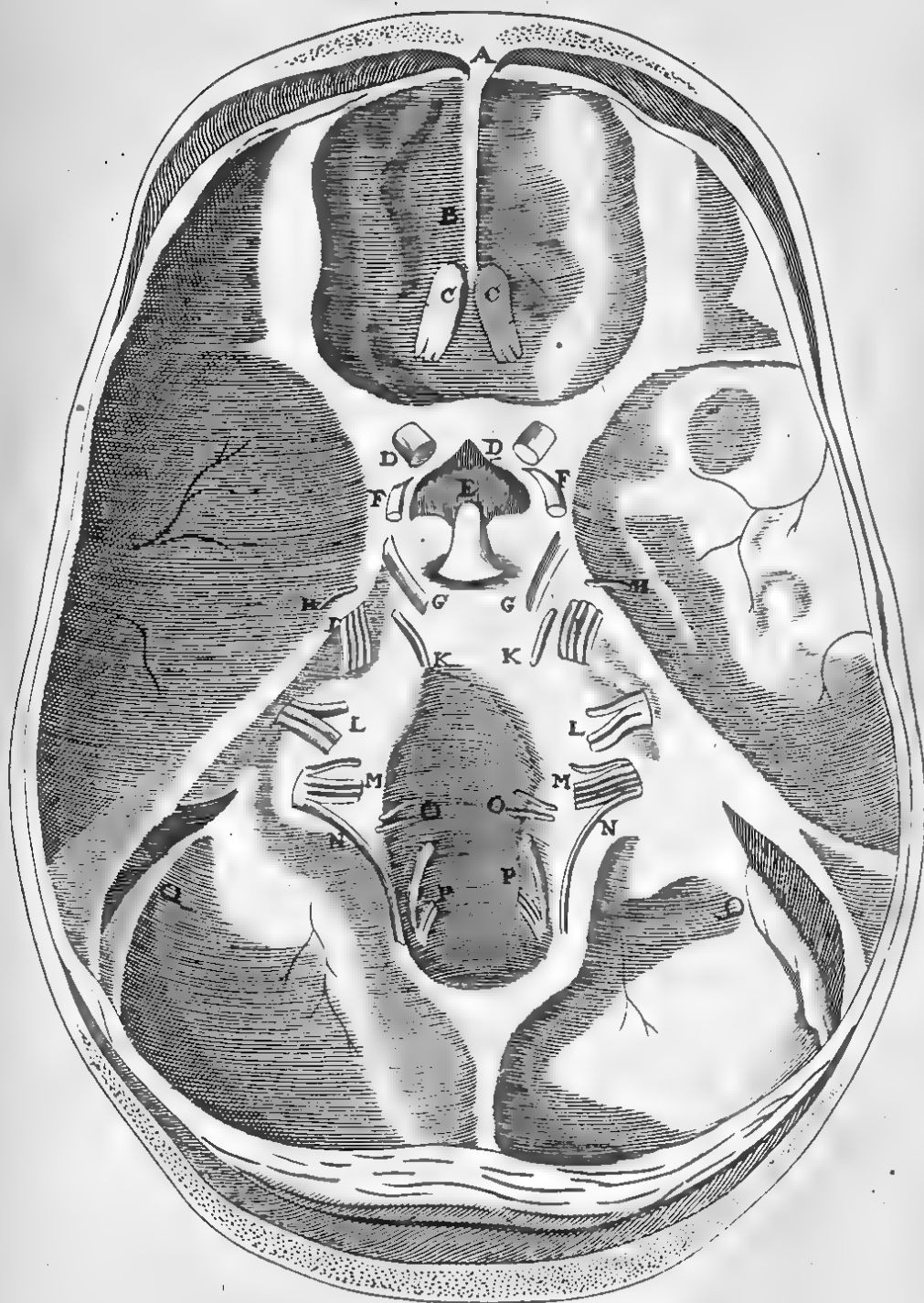
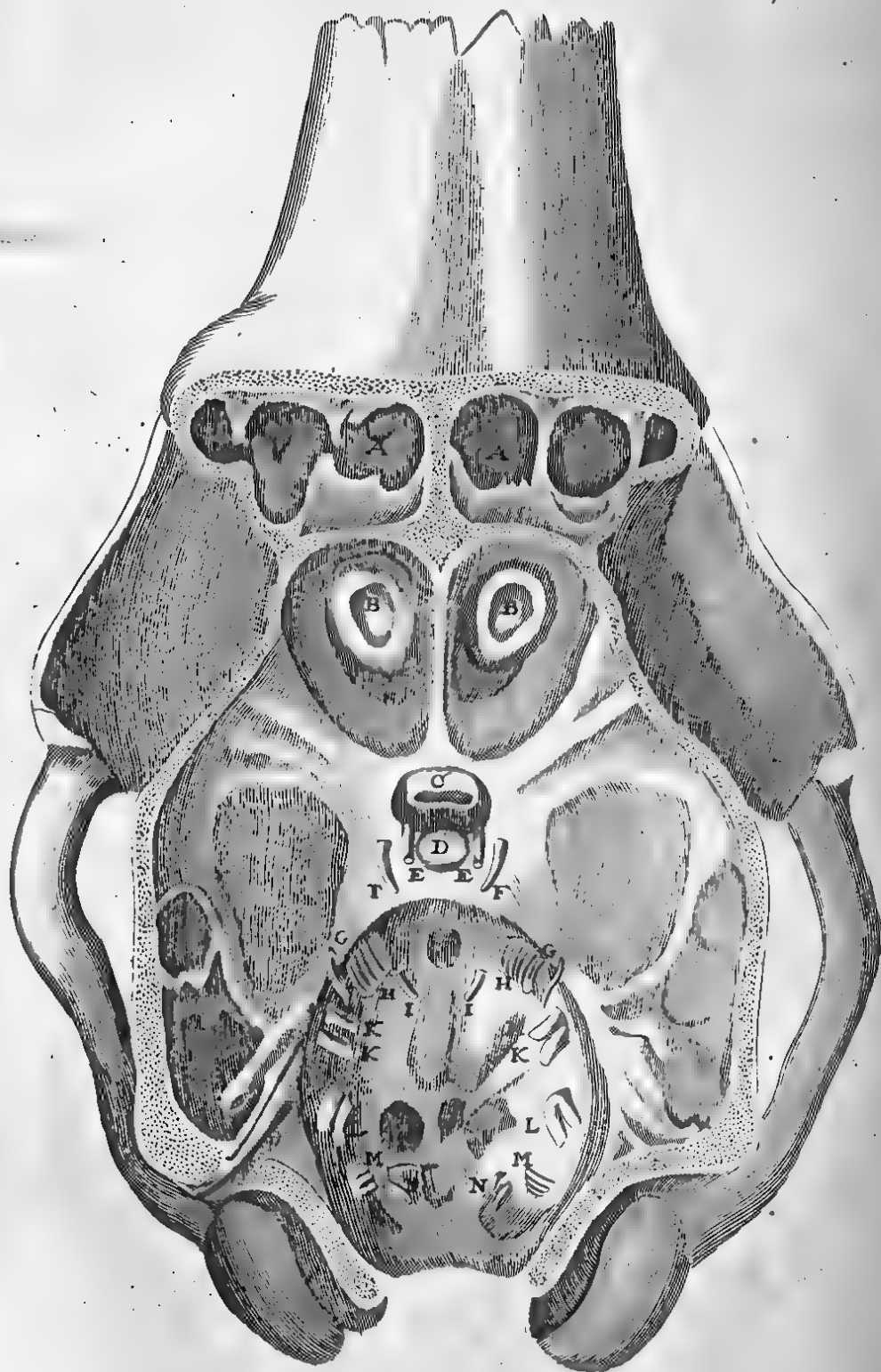


Fig. VI.

FF. p. 61.



through the Urinary pipes, or small passages perpetually into the *Pelvis*, and washeth away with it some of the more thin, and elaborate part of the nutritive juice, which is the sediment of sound Urine. *Phar. Rat. Part I.*

But indeed the Piss or matter of the Urine, as to its substance, quantity and qualities, proceeds chiefly from the mass of blood. For since there are three chief and special offices which this performs (as I have elsewhere shewn) that is to say, by kindling, or causing an heat to keep in the fire of life, by instilling the animal spirits into the Brain, and distributing the nutriment to all parts of the Body; for all and every of these purposes it must of necessity be dilated with a great deal of waterish humour, and likewise be moistened perpetually with it still fresh and fresh, after it hath sent away that which is stale; and that this be performed in a due and constant method is of great consequence to the preserving of health.

The fresh serous liquor is very easily introduced into the Blood along with the nutritive juice, and is thoroughly mingled with it most commonly without any impediment; but the stale doth not part from it always so readily and rightly as it should do; but there are many errors in the separation of it, from whence many Diseases are occasioned. For the *Serum* sometimes sticks to the Blood unseasonably, and cannot deliver it self from the embraces thereof: as in Fevers, of which there is no judgment at all, or at least but an ill one to be made, as also in a *Leucophlegmatia* or Droplic caused by white phlegm and a *cachochymia* or depravation of the Humours. But sometimes though it is expelled from the Blood, it leaves the Reins (which is the natural way of voiding it) and goes another way; as in Catarrhs, Gouty or Scorbutick defluxions, and in all sorts of Dropsies; and sometimes too on the other hand, the *Serum* getting too soon out of the Blood, runs away before it hath done its task or office, and sucking in some portions of the humours that are more useful, carries them along with it; as in a *Diabetes*, and great discharges of Urine that sometimes fall out, and presently cease again. In these cases, that is to say, as often as the quantity of Urine is either defective or excessive, the Reins are not always, or chiefly, but the Brain, and the Blood most of all uses to be in the fault; in as much as the mass thereof being sometimes too strict and compact doth not easily dismiss the *Serum* and other things therein contained, which ought to be evacuated, and being otherwhiles too loose and apt to dissolve, cannot contain or keep in the *Serum* and nutritive juice long enough. Now from what causes and operations such Irregularities proceed, we will a little enquire.

And indeed to resolve this doubt, the analogie or resemblance of Milk to Blood (which, because I have explained more at large elsewhere, I will here but briefly touch upon) doth very much conduce. Of Milk you may observe, that as long as the mixture thereof is preserved entire, though it boyls or bubbles up upon the fire, all its particles being promiscuously mingled make up one uniform liquor; but if you drop into it, whilst it is boyling, any thing that is acid, the thicker particles of it turn presently into a grosser curd, and the watery ones in the mean time are dissolved, with many of the saline ones, into a thin and plentiful liquor. Besides, it is a common ordinary observation, that if Milk that is kept so long till it grows sowre, be boyled upon a fire, it curdles of its own accord without pouring of any acid matter into it. And on the contrary, if at any time Milk be impregnated with any Salt of a nature different from acid Salt, (as for example, fixed, nitrous, or volatile) that is first dissolved in it, it is not at all curdled by an acid poured into it, when it is boyling upon the fire. For this I have often tried with Salt of Tartar and Wormwood, with Mineral Chrystal, with Flower of Salt Armoniack, with Spirit of Hartshorn, and other things of the like kind. Moreover (which is still a stranger thing) if you drop any of these Salts, or any dissolution of them into the Milk whilst it is a boyling upon the fire, and curdled by the acid matter that was infused into it, the curdling which was before, is for the most part dissolved, the white thick and hard substance presently vanishes, and the liquor is made thin and almost limpid again, though it does not totally resume the form and homogeneous nature of Milk. And indeed that such alterations as these do constantly happen, I have sufficient knowledge by frequent experience; to wit, that if you put Ale, or White Wine, or Cider, or Vinegar, or any acid juices into Milk whilst it is boyling upon the fire, it all presently loses the form of Milk, and turns to a white Curd and thin Whey. Then afterward, if you pour into the whole whilst it is yet hot, either Salt of Tartar, of Wormwood, or any other Vegetable dissolved, or the dissolution of Salt of Nitre, or Armoniack (yea the Flowers or Spirits of it, as also of the Spirit of Hartshorn, Soot) and the like, and mixture be a little disturbed, most of the thick part of it will dissolve, save onely some few remaining small portions, and little curdled bits, that will swim here and there upon the top of the liquor. Moreover on the

The matter of the Urine proceeds chiefly from the mass of Blood.

The Serum is separated from the Blood sometimes with difficulty, and sometimes too easily.

The reason of it is best explained by the dissolving, curdling and reducing of Milk.

How to hinder the curdling of Milk.

Phar. Rat.
Part I.

The reason of
these things is
given.

the other hand, if you throw fixed or nitrous Salt, or Flower or Spirit of Sal Armoniack, or Spirit of Hartshorn or Soot into boyling Milk, and then put Ale or White Wine, or Cider, or any other acid liquor into it, the Milk will not thereby dissolve or coagulate. How and from what causes these things happen and proceed, and what analogy or resemblance they bear to the dissolving or inseparability of the *Scrum* in the mass of Blood, I think it worth while here to consider.

From the Anatomy of Milk it plainly appears, that there are in it some few spirituous, a great many waterish, a pretty many sulphureous and earthy, and likewise some saline particles, which are partly volatile and partly fixed; whilst therefore the mixture is preserved entire, the saline particles sticking to the sulphureous ones, divide them from each other, and likewise hinder them from flying away, or uniting with the earthy ones; in the mean time the serous ones, being put in between the rest that are so equally mixed, fill up all the void spaces, and make the whole liquor as it were homogeneous: but whereas by the dropping in of the acid matter there happens presently a dissolution and coagulation of the liquor, the reason is, because the particles of fluid Salt in the acid matter catch hold of any other saline particles, whether fixed or volatile, in the Milk; to which, whilst they are fast united, the sulphureous particles getting out of the embraces of those that are acid and salt together, gather into one body, and so being united mutually among themselves, and with the earthy ones, they make up that thick curd that separates from the rest of the liquor: whilst in the mean time the watery Humor (in that its pores are almost quite destitute of sulphur and earth) being impregnated with little else besides the combinations of several Salts, grows presently thin and diluted. That it is really so, is very evident from the experiment just now cited, in as much as that curdling of the Milk is hindered, or taken off by the injection of fixed, nitrous, or volatile Salt: for every one of these Salts takes hold of the acid Salt which is in the Rennet that is infused, and by that means either preventeth or breaks off its union with the saline particles that are in the Milk: but whereas, though curdling of the Milk be taken off, yet its former hue is not restored to it, the reason is, because the extraneous particles of the Salts that are put into it, remaining still in the mixt body of it, do hinder the entire restoration of its mixture; but without doubt if those particles could be again expelled, or driven out, the former mixture would return as like Milk as before. Wherefore I may conjecture of the Blood, that though it be sometimes depraved by fusion or coagulation, because it uses to exterminate or drive out from it all heterogeneous particles, may recover its due and former mixture.

But whereas Milk that is kept too long and grows sowre, is curdled of it self upon the fire without any acid matter infused into it, the reason is, because in that liquor, which then tends to putrefaction, the saline volatile particles (as is usual) being depressed to a fluidity, become acid; and therefore they (since the pores of the Milk are opened in the boyling) catch hold of the saline fixed particles that are allied to them; to which whilst the sulphureous ones that came out of them, stick fast and close, (being also mutually united among themselves, and likewise with the earthy ones) they make a white Curd whilst the *Scrum* with the combinations of the Salts is dissolved into a waterish humour. Cold Milk will not curdle either of it self, nor if you put an acid into it; because when the pores are closed, the inward particles, however disposed, do not easily set themselves upon making either new unions or separations; but when the pores are opened by the heat, then as occasion is given, they presently make divisions and private combinations.

Having premised these things concerning the dissolution, coagulation, the prevention of that condition, and the reduction of it to its former state; let us now consider whether any thing like or analogous to what I have said, agree to the Blood or no. Now truly though we cannot resolve, variously separate, or curdle the Blood when taken out of the Vessels (and then reduce it to its former state again) by the affusion of saline matter, nor divide it into its constituent parts, as we can Milk upon the fire; because indeed the consistence of Blood is thicker than that of Milk, and more apt to grow grumous [or into a Gelly] and also that when the vital flame of it is extinguished, that consistence is very much changed from what it hath in the Vessels; yet I have often tried and known (what the experience of others also doth confirm) that the same liquors that dissolve and precipitate Milk, as distilled Vinegar, Spirit of Vitriol, the dilution of Salt or Nitre, and other acids, when poured into hot Blood, do presently curdle and discolour it, in such a manner, as that when the whole mass grew black, one part turn into a thick Cake like Gelly, and the other into a thin, watery *Scrum* or Whey. So likewise those things that hinder or take off the curdling of Milk, as Oil of Tartar, the fixed Salts of Plants, the dissolution of the Salt of Nitre, or slacked Lime, Spirit of Sal Armoniack, of Harts horn, and the like, if poured into the Blood when

There is some-
what in the
Blood analo-
gous to the cur-
dling of the
Blood, &c.

what altera-
tions Chymical
Liquors poured
into Blood
when it is hot,
do produce.

when it is hot, preserve its mixture entire, or rectifie it, as we may conclude from its ruddy bright colour, and the consistence of it that remains so long and so even: so that it easily follows from hence, that Blood consists of the same elementary particles as Milk, though in a different proportion. For in the Blood there is a greater quantity of Spirit, Sulphur, Salt, and Earth, and less Serum than there is in Milk. From whence we may conclude, that the Blood when rightly disposed, that is, the thicker sort of it, is too apt to curdle or turn to a Gelly, but is not so liable to dissolution, or being turned into many serous parcels; and yet, that whilst it passes through the Reins in its circulation, all superfluous waterishness is separated and carried off from it, partly by the strainer of the Reins, and partly by the ferment of them, which keeps the Blood from too excessive coagulation. But when the Blood is vitiated in its temper, there are many irregularities both in the constitution of it, and in the separation of the Serum. As to the first, the Blood sometimes is too hot and sharp, and otherwhiles too thick and fæculent or dreggy, as at other times also excessively thin and waterish; and according to these several degenerated conditions or states of it, several Distempers do arise, of which it is not proper in this place particularly to treat. But howsoever the Blood is disordered in its temper, yet whilst the Serum of it is separated in its due measure and method, the Party is not therefore presently very sick upon it. But a great many Distempers happen to spring from the ill separation of the Serum. And in this case, as there are many sorts of errors, so most commonly the fault lies either in excess or defect. For sometimes the serous Liquor sticks too close and fast in the embraces of the Blood, and on the contrary, sometimes slips away too soon; and in this respect, the Blood being not able to keep in the Serum, spews it out at the mouths of the Arteries in many places, almost all over the Body; and by that means discharging it into the Bowels, or the habit of the Body, produces an *Ascites* [a Dropsie so called] or an *Anasarca* [another kind of Dropsie] yea and sometimes sending it immoderately into the Reins, causes a *Diabetes*. The Blood when it keeps in the Serum, too strictly, either boils up for the most part in a Fever, and is more compact in its constitution (whilst the thicker particles at the same time are mixt, and contempered with it) so as that the thinner particles do not easily break forth; or being filled with scorbutick Salt and Sulphur, it becomes very clammy and glutinous, in so much that the serous parts can scarce get away out of the company of the rest. Now seeing that the separation of the serous Liquor is hindered or perverted so many several ways, there are also Diuretick Medicins of a different nature and operation; which yet may be distinguished; and first of all, as to their end, as they respect the mass of Blood, or the Reins, or both together. Secondly, As to their Matter, as they are either sulphureous or saline: and these again are very various, according as the saline particles are in a state of fixedness, fluidity, or volatility, or otherwise, nitrous or Alchalized. Thirdly, As to their Form, these Medicins are very different; but most commonly the Compositions of them, as to their appearance, are either Potions, or Powders, or Bolusses, or Pills, or Chymical Liquors, of which hereafter we will particularly discourse. In the mean time, although it may seem that the explanation of the particular designs and ends of Diureticks belongs more to the speculative than the practical part of Physick, yet I think it necessary in this place briefly to point out the chiefest of them. Then in the second place, to distinguish Diuretick Medicins, as to their Matter, which in every one of them is most commonly saline onely. And in the last place, to subjoin the choicest Forms of Receipts in every kind.

First therefore, when the Blood becomes so thick and clammy through the mixture and mutual combination of fixed Salt with Sulphur and Earth together, that the watery particles cannot easily part from the rest, the Diureticks, to loosen its constitution and dissolve the Serum, ought to be such as are full of volatile or acid Salt: for such particles chiefly dissolve the Combinations made by the fixed Salt. But seeing this disposition is common both to the Fever and the Scurvy, in the former case the most proper Diureticks are not onely the temperate acids of Vegetables, as also Salt of Nitre, Spirit of Sea Salt, Vitriol, &c. but also such as are impregnated with volatile Salt, as Spirit of Harts horn, and of Sal Armoniack, Salt of Amber, of Vipers, and others of the same kind; which we have hereafter recounted in the number of Diaphoreticks also. In the Scurvy, seeing the Urin is but little, and that thick too, the juices of Herbs, and Preparations, both acid and sharp, are of great use; as also Sal and Spirit of Piss, of Sal Armoniack, of Tartar, &c.

Secondly, Sometimes the Blood doth not keep the Serum within it long enough, but being obnoxious either to fluxions, or rather coagulations, dischargeth it here and there in very great quantities, and causes Catarrhs, or Tumors in several places; or the Blood being habitually weak, and at the same time of an ill temper, that is incli-

Phar. Rat.
Part I.

That the Blood may rightly separate the Serum it ought to be kept from growing too thick or too thin.

The excessive separation of the Serum.

The defective separation of the Serum.

A division of Diuretick Medicins,

1. As to their End.
2. Their matter.
3. Their Form.

1. Saline Diureticks:

1. Such as agree best when the Blood is too compact.

And 2. what agree best when it is too loose.

ning

Phar. Rat.
Part I.

ning to acidity, is apt, as to its thicker particles, to curdle; in so much that the thinner parts of it being sent away, whilst it circulates, and settling in the weaker parts, produce sometimes pains in the head or breast, and sometimes an *Ascites* or *Anasarca* [two sorts of Dropsies]. Moreover from the like cause I shall by and by shew that a *Diabetes* proceeds. For indeed many obstinate Diseases that are imputed to the ill temperament of the Bowels, arise from this cause; to wit, for that the Blood being of an ill temper and liable to coagulation, seeing it cannot continue the whole motion of its circulation, doth in many places discharge and leave the *Serum* which is too apt of it self to separate, and lodge where it should not. In these cases such Diureticks are to be given that may not dissolve the Blood, but take off its coagulation onely; such as are Medicins impregnated with fixed, volatile or even alchalized Salt; and likewise such as corroborate and restore the ferment of the Reins, as some sulphureous and spirituous ones. To these ends serve Diureticks that are sulphureous and mixed, lixivial or leyish Salts of Herbs, Powders of Shells, Sal and Spirit of Piss, &c. Millipedes [or Woodlice] Roots of Horse-radish, Parsley Seeds, Nutmeg, Turpentine and the Preparations of it, and Spirit of Wine; the virtue of all which, is not to dissolve the Blood, and precipitate serous matter out of the mass thereof (for that acids do best, and in such cases often hinder the flowing of the Urin) but to dissolve the curdling of the Blood: so that the constitution of it having recovered its entire mixture, and circulating more swiftly through the Vessels, may suck back the *Serum* that is any where extravasated [*i. e.* out of its Vessels] or lodged where it ought not to be, and may at last deliver it to the Reins to be by them carried off. How Diureticks of all kinds work according to both these, almost opposite ends of Physick, and under what Forms they are most commonly prescribed, I shall now in the next place shew you.

CHAP. II.

The sorts and forms of Diureticks [or Medicins that purge by Urin] as also the Reasons of the Chymical Preparations of some of them.

First therefore, as to Saline Diureticks [or salt Medicins that purge by Urine] that which I have oftentimes inculcated, ought to be here taken notice of, to wit, that what ever Salts of different tempers are put together, they mutually lay hold of each other, and are immediately conjoined; and that whilst they so combine, the other particles, being loosened from the mixture, divide or fly several ways. This is evidently seen when fluid or acid Salt is put to fixed or alchalized; and likewise when fluid or fixed is mixed with volatile or sharp Salt. Indeed the whole business of Dissolutions and Precipitations depends upon this one quality of Salts. Wherefore since the Blood and Humours of our Bodies abounds with much Salt, and that usually altered from one state to another, and consequently the cause of various indispositions; and seeing furthermore that there are divers kinds of saline Diureticks, filled with fixed, fluid, nitrous, volatile, or alchalized Salt, it will require great discretion and judgment in a Physician so to order it, that the saline particles in the Medicin may differ from those in our Bodies. How this may be done I will shew you by running over each kind of saline Diureticks.

The diverse
States of Salts.

Their various
affections.

Diureticks im-
pregnated with
acid Salt.

where they are
agreeable.

Among saline Diureticks impregnated with acid Salt, the Spirit of Salt or Nitre, as also the juice of Limons, and Wood Sorrel, White Wine, Rhenish Wine and Cider are of prime note among the Vulgar, and oftentimes perform that intention: for these alone dissolve the Blood, and precipitate it into *Serum*, as when an acid is dropped into boiling Milk. But this doth not happen alike in all, nor even to any equally. In an hale constitution, or such as is not much different from it, the Salt of the Blood is partly fixed, partly nitrous, and partly volatile; so also in some Scorbutick and Hydropical Bodies, it becomes most commonly fixed. Wherefore in every of these cases, Diureticks impregnated with acid Salt, are used with success; but in Catarrhs, and some hydropical and scorbutical Distempers, when the saline-fixed particles of the Blood are exalted into a state of fluidity, and the volatile ones are depressed (as it often happens) acid Remedies usually do more hurt than good; in as much as they more pervert the Blood, that is already degenerated from their right temper: but in such cases, Medicins impregnated with fixed or volatile Salt will be more helpful.

The

Phar. Rat.

Part I.

Powders.

The Forms of Diureticks that have acid Salt for their Foundation.

Take of the Powder of choice white Tartar, of Chryſtal Mineral, each $\mathfrak{z}\text{ij}$. of Crabs eyes pulverized $\mathfrak{z}\text{j}$. and make a Powder. The Doſe is from $\mathfrak{z}\text{ß}$. to $\mathfrak{z}\text{ij}$. in a convenient vehicle, repeating it every ſixth or eighth hour.

Take of Tartar vitriolated, or nitrated $\mathfrak{z}\text{ij}$. of the Powder of Egg-shells $\mathfrak{z}\text{j}$. $\mathfrak{ß}$. of Parſley or wild Carret ſeed $\mathfrak{z}\text{ß}$. and make a Powder. The Doſe is $\mathfrak{z}\text{ß}$. to be taken in the ſame manner.

Take of the beſt Spirit of Salt $\mathfrak{z}\text{ij}$. of Harts horn burnt and pulverized, a convenient quantity as much as will imbibe the Spirit, and make a Powder. The Doſe is from $\mathfrak{z}\text{j}$. to $\mathfrak{z}\text{ß}$.

Take of the juice of Limons $\mathfrak{z}\text{ij}$. of compound Radish Water $\mathfrak{z}\text{j}$. $\mathfrak{ß}$. of Syrup of the five A Drink. Roots $\mathfrak{z}\text{ij}$. and make a Drink or Potion.

Take of the juice of Sorrel $\mathfrak{z}\text{ij}$. of White Wine $\mathfrak{z}\text{vj}$. mingle them and make a Potion.

Take of compound Radish Water $\mathfrak{z}\text{ij}$. of Pellitory of the Wall $\mathfrak{z}\text{iv}$. of Spirit of Salt $\mathfrak{z}\text{j}$. xv. drops, of Salt of Tartar gr. xv. of Syrup of Violets $\mathfrak{z}\text{ß}$. and make a Potion.

2. That Medicins impregnated with fixed or lixivial Salt, provoke Urin, is very Diureticks im-manifest from the vulgar and quack Phyſick that is commonly uſed to cure Dropſies; pregnated with for in an *Anasarca* [or Dropſie that goes through the habit of the Body] and ſome- fixed Salt. times in an *Ascites* [a Dropſie that makes the Belly ſwell like a Bottle] when the Bowels or Fleſh are exceſſively ſwelled with a conflux of Water, they frequently give a *Lixivium* or Lie, made of the aſhes of Wormwood, or Broom, or Bean-ftalks, with White Wine: from whence commonly proceeds plentiful piſſing, by which the Diſtemper is removed. But yet I have obſerved, that that Medicin in ſome People hath not been at all Diuretick, but hath increaſed rather than cured the dropſical in-diſpoſition: of which if you would know the reaſon, it is manifeſt from what I have already ſaid, that lixivial Salts do neither diſſolve nor precipitate neither the Bloud nor Milk, and therefore are not in their own nature diuretick; but yet that effect ſome-times follows, in as much as the fixed Salt, being copiouſly taken in, deſtroys the operation of the acid and coagulative or curdling Salt that predominates in the Bloud; and conſequently the Bloud, though before it were too apt to be diſſolved, and could not contain its Serum, but thruſt it forth in all places, yet now by the approach of the fixed Salt, recovers it due temper, and therefore ſucking back the Serum that was ex-travaſated, and carrying it down to the Reins, it cauſes plentiful piſſing.

2. Forms or Receipts of Diureticks that have fixed Salt for their Foundation.

Their Forms or Receipts.

Take of the Salt of Tartar or Wormwood $\mathfrak{z}\text{ij}$. of Coral calcined till it be white $\mathfrak{z}\text{j}$. $\mathfrak{ß}$. of Nutmeg $\mathfrak{z}\text{ß}$. make a Powder. The Doſe is $\mathfrak{z}\text{ß}$. to $\mathfrak{z}\text{ij}$.

Take of the Tincture of Salt of Tartar $\mathfrak{z}\text{j}$. to $\mathfrak{z}\text{ij}$. $\mathfrak{ß}$. of compound Radish Water $\mathfrak{z}\text{j}$. $\mathfrak{ß}$. mingle them, and give it in a draught of Poſſet drink, with Roots and Seeds of Burdock boyled in it.

Take of the Deliquium [or Oil] of Salt of Tart, that floats beneath, whileſt the Tincture is extracting, and of Wine impregnated with Sulphur $\mathfrak{z}\text{ij}$. to $\mathfrak{z}\text{j}$. $\mathfrak{ß}$. of White Wine $\mathfrak{z}\text{iv}$. to \mathfrak{vj} . of Syrup of the five Roots $\mathfrak{z}\text{ß}$. mingle them, and make a draught, to be repeated twice or thrice a day.

Take of the whiteſt aſhes of Vine twigs half a Pint, of Nutmeg $\mathfrak{z}\text{ij}$. pour to it of White or Rheniſh Wine two Pints and an half. Let them ſtand hot and cloſe for a day, and then keep the ſtraining for your uſe. The Doſe is $\mathfrak{z}\text{vj}$. twice or thrice a day.

Take Flints heated red hot in the fire, and quench them in White Wine or old March Beer, and drink of that Liquor $\mathfrak{z}\text{vj}$. or \mathfrak{viii} . twice a day.

Take of ſlacked Lime water $\mathfrak{z}\text{iv}$. to \mathfrak{vj} . of the Tincture of Salt of Tartar $\mathfrak{z}\text{j}$. to $\mathfrak{z}\text{ij}$. $\mathfrak{ß}$. make a draught, to be taken twice or thrice a day.

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3. For

Phar. Rat.

Part I.

Diureticks, im-
pregnated with
volatile Salt.
Why they do
good.

3. For the same reason that fixed Salt is used, in a sharp indisposition of the Blood, to provoke Urin, they use also volatile Salt sometime, and that with success; in as much as the particles thereof being admitted into the Blood destroy the predominancy of the fluid Salt that is in it; and consequently the Blood, recovering its due mixture, and being freed from curdling and defluxions, sucks back all the Serum that is extravasated and delivers over to the Reins all that is superfluous to be carried off through the Ureters or Piss-vessels. But yet those Medicins which are prepared with volatile Salt, (because they have particles that are somewhat strong and elastical or springy) when they mend or rectifie the temper of the Blood, dispose that part of the Serum, that is superfluous, for evacuation by Sweating sometimes as well as by Pissing. Now to this rank of Diureticks, not onely pure and sheer volatile Salt, drawn out of Animals or Minerals by Distillation, but even the integral parts both of living and vegetable creatures (such as the Powders and Extracts of Insects and Vegetables that are sharp) ought to be referred.

3. Forms or Receipts of Medicins that have Volatile Salt for their Foundation.

Powders.

Take of the salt of Amber, and of salt of Nitre, each 3 ij. make a Powder. The Dose is ʒj. to 3 ʒ. in a convenient vehicle.

Take of the Flower of Sal Armoniack, and of Mineral Chrystal, each 3 ij. and mingle them. The Dose is ʒj. to 3 ʒ. in a spoonful of compound Radish water. Give the Salt of Urin after the same manner.

Take of the Powder of Bees ʒj. of Lovage seeds ʒ ʒ. make a Powder, and give it in a spoonful of distilled Water.

Potions.

Take of the spirit of Urin from ʒj. to 3 ʒ. of compound Radish water from ʒj. to 3 ʒ. ʒ. of Juniper water ʒ ij. mingle them and make a Potion. You may give the spirit of Tartar after the same manner in a double quantity.

Pills.

Take of Millepedes prepared 3 ij. of the Flower of Sal Armoniack 3 ʒ. of Nutmegs pulverized 3 ʒ. of Venice Turpentine a convenient quantity, and make them into Pills. Let the Patient take iv. twice a day.

Take of the Powder of the Seeds of Burdock 3 ij. of wild Carret 3 j. of the salt of Amber 3 j. of Oil of Nutmegs ʒ ʒ. of Capivy Balsam a convenient quantity. Make a Mass and form it into small Pills, of which you may give iv. night and morning.

A Decoction.

Take of the Roots of Chervil, Parsley, Fennel, Ringo, and Restharrow, each ʒj. of the Leaves of Saxifrage and Clivers, each one handful, of the Seeds of Hartwort and Grumwel each half an handful, of Juniper berries 3 vj. boyl them in iv. Pints of Spring water till half be boyled away, and then put to it one pint of Rhenish Wine, and of the best Honey ʒ ij., and so make an Apozeme or Decoction. The Dose is ʒ vj. twice a day.

A distilled water.

Take of fresh Millepedes two pints, of the Leaves of Clivers, Chervil, Saxifrage, and of Golden Rod, each two handfuls, of wild Radish roots ʒ vj. of Nutmeg ʒj. of Juniper berries, of Seeds of wild Carret, each ʒ ij. cut them to pieces, bruise them and pour to them of Whey, made with White Wine viij. pints, distil them in the common vessels and mingle all the liquor. The Dose is ʒ iv. twice or thrice a day.

Strainings.

Take of fresh Millepedes washed, from the number of 40. to 60. of Nutmeg ʒ ʒ. which when you have bruised, pour to them of the distilled water of Saxifrage ʒ ij. Strain it and drink it.

Take of the Leaves of Chervil, and Parsley of Macedonia, each three handfuls: bruise them, and pour to them of White Wine a pint and an half; then strain it well, and keep it in a glassen Vessel. The Dose is ʒ ij. twice a day.

A Tincture.

Prepare a Tincture out of Millepedes, Bees, Grasshoppers or dried Catharides, with the Tincture of the salt of Tartar. You may give it from 15 or 20 drops to 30, in a convenient vehicle.

4. That

4. That Nitre is a kind of Salt, is very manifest from the figure, colour, taste, with other properties and accidents belonging to it. But yet this is different from all other sorts of Salt, or any state of saline particles, nor is it either acid, or fixed, or volatile; but as it were a mean betwixt both. It so far participates of volatile Salt, as that when it is made, it ought to be elixivated, or prepared with a Lie, and joined to fixed Salt, that it may thereby gain a kind of concretion or bulkiness. Moreover, When it is melted, if you put any Sulphur into it, it immediately takes fire and flies away: but it so far communicates with fixed Salt, that being melted in a crucible, it indures a long, and it may be, perpetual fusion, without any considerable diminution of its parts or particles. Indeed it is Nitre onely, whereby all Plants flourish, all Animals live and breath, and wherewith all sublunary fire is kindled and fomented or kept in; as I have shewed in another Treatise, which I have no necessity here to repeat.

But as to what concerns our present business, it is sufficiently known, that the Salt of Nitre cools the Blood, and provokes Urin very strongly: but the reason of both these effects is not so very evident: for Nitre is so far from containing in it such cooling particles; that on the contrary, nothing is more fiery, as you may see in Gunpowder; and if you distil it, you would think a flame rather than a vapour or fume came forth into the Receiver: Besides that, the *stagma* or distilled liquor that drops from it, burns and corrodes all things that come near it, just like to actual fire. Nor have we less reason to wonder how this Body, whose nature is so exceeding fiery, should so dilute the blood, and dissolve or melt it into waterishness in order to provoke Urin.

Upon these things, that I may give you my conjectures, I say, that Nitre conduces to the production of those effects in a double respect; to wit, both as it is a Salt, somewhat allied to fixed and volatile Salt, and also as it is a fiery body. As to the former, I have observed that Nitre (like fixed and volatile Salts) being put into Milk, doth either hinder or take off the curdling of it; and likewise that if you pour Blood whilst it is hot, upon this, as you do upon those it will preserve it from curdling or being discoloured. Wherefore seeing the particles of Nitre taken inwardly, do either keep the mixture of the Blood entire or restore it, they consequently will prevent or take off the meltings or curdlings thereof, from whence proceeds heat and difficulty of making water.

But furthermore Nitre, as it is a fiery body, if inwardly taken, will cool the Blood when it is in an excessive heat, and provokes Urin; in as much as (which I intimated before) it augments, by coming in, the flame of the Blood, which before was dim and mixed with smoakiness, and making it more clear and pure, doth consequently render it more gentle; and when by that means the Blood (whilst it burns more bright through the intermixture of the Nitre) is more loosened in its constitution, the ferrous particles are more easily extricated, or disengaged from the thicker, and do more plentifully run away.

4. Receipts of Diureticks, that have Nitre for their foundation.

Take of Nitre prepared 3 ij. of Barley water, with the roots of Grasse and candid Ringo boyed in it, two Pints, of Syrup of Violets 3 ij. mingle them. The Dose is 3 iv. twice a day.

Take of Sal Prunella 3 ij. of white Sugar 3 j. make a Powder, to be divided into six parts, whereof take one in any convenient liquor, thrice a day.

Powders:

Take of Sal Prunella 3 iij. of Salt of Amber 3 j. and make a Powder. The Dose is 3 β. thrice a day.

Take of Sal Prunella, of Crabs Eyes, and of Salt of Wormwood, each 3 ij. mingle them. The Dose is 3 β. thrice a day.

5. It is also very vulgarly known that some Powders of Shells and Stones, that are impregnated with an alchalized or petrifying Salt, do sometimes provoke Urin. For to some that have been troubled with great Stranguries, or difficulty of Pissing, the Powder of Egg shells, and of the Claws or Eyes of Crabs, hath been a present remedy. Of which if you inquire into the manner and reason of their operation, it is very manifest that such Medicins do not dissolve or sensibly precipitate the Blood. Wherefore we must conclude, that these are sometimes (upon a slowre indisposition of the Blood and Humours) diuretical, or apt to provoke Piss, in as much as they by

Diureticks impregnated with alchalized Salt.

Phar. Rat. their combination or sticking together do bind and restrain the acid Salts, so that the
Part I. Blood, being freed from all fluxions and coagulations, sucks back the extravasated Serum, and transmits it to the Reins.

Their Forms or Receipts.

5. Receipts of Diuretick Medicins, that have Alchalized Salt for their foundation.

Take of the shells of Eggs powdered 3℔. to 3j. give it in a draught of White Wine, or Posset drink, or Diuretick Decoction, twice a day.

Take of the Powder of the Claws or Eyes of Crabs 3ij. of Salt of Amber, and of Nitre, each 3j. of Nutmeg 3℔. make a Powder. The Dose is 3℔. to ʒij. in a convenient vehicle. Or take the aforesaid Powder with a convenient quantity of Venice Turpentine, and make it into small Pills. The Dose is iij. or iv. night and morning.

Diureticks that are sulphureous and spirituous.

You may justly reckon among such things as are Diuretical, not onely saline Bodies, but also some sulphureous and spirituous ones too, in as much as they often produce the same effect. Many Gums, as especially Turpentine, (and such Medicins as are prepared out of them) Oils of Juniper, Nutmeg, Wax, and that which drops from other fat things, being taken inwardly, provoke Urin (in many People) very plentifully, which hath a smell like that of Violets. I have known in some hydro-pical and scorbutical persons, that the spirit of Wine, and hot Waters, yea and generous Wine also, if largely drunk of, hath provoked Urin; of all which the reason is, because when the Blood is weak or sowerish, or, through the defect of fermentation, or the predominance of an acid and coagulating Salt, doth not circulate so briskly and equally as it should do, so as to contain the superfluous Serum within it, till it can deliver it over to the Reins, the aforesaid Remedies (in as much as preserve the mixture of the Blood entire, or restore it when decaying) conduce very much to the provoking of Urin.

Their Receipts. Distilled water.

Take of the fresh Berries of Ivy, Juniper, and Laurel, each half a pound, of the Seeds of wild Carret 3iv. of Nutmeg 3ij. After you have bruised them, put to them in a Glassen Retort, of the best Venice Turpentine one pint, of Spirit of Wine rectified four pints, distil them in an Oven of Sand with a moderate heat till they are dry, taking care that they burn not; and you will have a Spirit and an yellow Oil, which are both exceedingly Diuretick. The Dose of the Spirit is from 3j. to 3ij. or iv. of the Oil ʒj. to ʒj. in a convenient vehicle.

A Tincture.

To the dregs that are left behind in the Retort, pour of the Tincture of Salt of Tartar one pint; and let them digest close in an Oven of Sand for several days, that the red Tincture may come forth; of which the dose is from ʒj. to ʒij. or 3j. in a convenient vehicle.

A Spirit and an Oil.

Take of prepared Millepeds 3iij. of Nutmeg 3j. bruise them, and pour to them of the purest Spirit of Turpentine, and of the Tincture of Salt of Tartar, each 3vj. distil them with the gentle heat of a Bath, and you will have a Spirit, an Oil, and the deliquium or melting of the salt of Tartar, each of them impregnated with a notable diuretick quality.

The Reasons of some Preparations.

1. *Sal Prunellæ, or Chrystal Mineral, which is nothing else but purified Nitre.*

Sal Prunellæ.

Take of choice Nitre a convenient quantity, and dissolve it in Spring or Rain water; boyl it a little, and lay it up in a deep glassen Vessel, to chrySTALLIZE, in a cold place: then pick out the whitest and most clear chrystals onely, which you must again by often dissolutions and chrySTALLIZATIONS, reduce to the highest degree of purity; and they after that, being melted in a crucible and poured out into a silver Vessel, will harden into very white stone. Of this, when pulverized, the Dose is from ʒj. to 3℔. or ʒij. which cools the boyling of the Blood, and provokes Urin.

The reason of it.

This Preparation is so ordered, that the nitrous particles, as much as is possible, may be separated quite and clean from the fixed Salt, and harden into Chrystals distinct by themselves; for when the Nitre is first made out of the Earth, and drawn forth by a Lie, the particles thereof are so unapt to grow together, or chrySTALLIZE, that

it is necessary for the nitrous Lie to be again elixivated with ashes, and impregnated with fixed Salt, to the end that the nitrous particles, being partly united to the Leyish ones, and partly, by the intervening of them, thrust out of the pores of the Water, may gain a kind of concretion or hardness: wherefore seeing the Body or Salt of Nitre is formed in that manner, see that the particles of fixed Salt be, by frequent dissolutions and chrystallizations, purged away, as much as possible, to make it the purer for Physical uses.

Phar. Rat.
Part I.

2. Spirit of Nitre.

Take of the purest Nitre lb j. of Powder of Bricks lb ij. which when you have well pounded and mixed, put them into a glassen Retort, luted or into an earthen one, and distil them in a reverberating Oven with a fire gradually augmented. The red Fumes will make the Receiver glitter with a kind of flame colour, and when they are condensed will make a distilled liquor which is acid and exceeding corrosive. The Dose is iv. to vj. in a convenient vehicle.

Spirit of Nitre.

Although Nitre, mixed with Sulphur, is soon set on fire by the least particle of igneous matter, and breaks out into flames; yet, being destitute of that, it may be melted in a crucible, or distilled in a Retort, without any burning at all. The Powder of Bricks is added to it, that when the Salts are melted by the fire, they may not mutually get hold of, and chain together each other, but being divided and separated from one another, may, by the force of the fire, be driven forth from their subject.

The reason of it.

Nitre, when melted, retaineth its inflamable quality; but the distilled liquor will sooner put fire out than kindle it. For if at any time you put it among sulphur, that mixture can very hardly, and not so soon as sulphur, be kindled by it self; the reason of which is, because the nitrous Salt, having undergone a dissolution, is quite altered from its natural state, and gaineth much such another sower temper, as other Salts that have suffered the like mutation; yea out of Sulphur there is drawn an acid stigma or liquor, that rather destroys than augments inflammations.

3. Spirit of Sea Salt.

Take of Sea Salt, dissolved and powdered, lb j. of Bricks coarsly pulverized lb iij. pound them together, and mix them: then put to them some good big Brick-bats to the quantity of lb β. when they are well mixt and put into a strong Retort, distil them with a fierce reverberating fire for 24. hours; rectifie the distilled liquor with the heat of Sand in a glassen Cucurbit, drawing off the phlegm or waterish part; and there will remain in the bottom a Spirit, of an yellow or greenish colour, that hath a smell and taste very grateful.

Spirit of Sea Salt.

This Salt is very difficult to be driven or forced into a sharp liquor, because the particles thereof, more than any other saline ones that are in Minerals, to wit, in Vitriol, Nitre, Alum, &c. being most strictly united, cannot easily be parted from each other, or separated from the embraces of the Earth; wherefore when they are loosened by the fire, mingle with them the Powder of Bricks, in a threefold quantity, to keep them from running together; and besides that, I thought fit to put between them good big pieces of Bricks, that the mass that is to be distilled, being hollowed as it were with holes through it, might be every where penetrated or pierced by the fire. Yet notwithstanding, as you distil them, the Salts being dissolved by the fire, will very often run together, in so much that afterward that cannot be driven forth with any force of fire.

The reason of it.

That it is so, is very plain, because if by Art this union of the Salts among themselves and with the Earth be broken off, they are easily forced into an acid stigma, or distilled liquor. For example;

A more compendious way.

Take of the Spirit of Vitriol not rectified one pint, and in a glassen Retort, pour it into Sea Salt calcined and pulverized, and immediately distil it in Sand, the spirit of the Salt being expelled as it were by the other will easily ascend, whilst the spirit of Vitriol stays in its room; that is, this spirit of Vitriol being more ponderous and stronger, and likewise bereft and covetous of an earthy habitation, drives the other out of its possessions, and at the same time invades them it self.

4. Spirit of Piss.

Take of the Piss of a sound man that drinks Wine, what quantity you think fit, and when you

Phar. Rat.
Part I.

you have put it into a Cucurbit with a blind Still, let it rot in dung for a moneth; then distil it in Sand. The liquor distilled from it being rectified in a deep Cucurbit, affords a spirit and a volatile Salt.

This operation may be performed more compendiously, if you evaporate fresh Urin to a fourth part of what you first took, to wit, that when the phlegm is exhaled, the saline particles may more closely incorporate with the sulphureous and earthy ones. To this thick composition (after you have put it into the Cucurbit) pour either a Lie made of Alhes or Salt of Tartar, or the dissolution of slacked Lime; and then putting on the Still, distil it in an Oven of Sand; and you will easily gain a Spirit, and a volatile Salt, which by rectification are purified and separated.

The reason of it.

The reason of these proceedings is, because in that the Urin consists of a double kind of Salt, that is to say, a nitrous and a volatile, together with a great deal of Sulphur and Earth, the particles of volatile Salt (whilest the mixture remains entire) are so detained and strictly compacted by the other saline ones, together with the rest of the thicker elements, that the spirits cannot break forth, or be divided and separated by the force of fire; but when by long rotting [in the dung] the mixtion of the liquor is loosened, the saline volatile particles, which at length do extricate or disentangle themselves from the rest, ascend first in the distillation. Moreover the same effect also doth easily ensue, when a fixed Salt that is different from the nitrous, is poured in; for whilest the particles of the nitrous Salt are laid hold on by those of the other Salt that is infused, the volatile Salt escaping out of its restraint, doth easily make its way and is gone. Hither you may refer what I shall hereafter say of the distillation of Sal Armoniack.

5. Tincture of Salt of Tartar.

Tincture of
Tartar.

Take of the purest Salt of Tartar 3vj. melt it and let it remain in the crucible till it gains a blew, or almost a green colour; then, having pulverized it whilest it grows hot, and put it into a strong Matrace or Glass Still with a long neck, pour to it rectified spirit of Wine the depth of three or four fingers, and let it digest in an Oven of Sand upon a quick fire for several days, till the tincture be extracted. For by long digestion the spirit of Wine gains a ruddy colour, in as much as the particles of fixed Salt, being in some measure exalted, are united to the vinous sulphur. In the mean while the remaining salt of Tartar, which is diluted with the phlegm of the Wine, sinking down into Deliquium or Oil, and floating by it self will separate below; which is much better than the common Oil of Tartar, in that it participates of the vinous sulphur; and in some cases, where there is a necessity for a lixivial Diuretick, it is a very good Medicin. The Dose is ʒj. to ʒij. or 3j. The Tincture is given from 3j. to 3j.ʒ. or 3ij.

The reason of it

The tincture of Salt of Tartar, by reason of the union of the vinous salt and sulphur, hath a very grateful smell and taste. If you distil the liquor to an half, the remaining part will retain in it more salt and sulphur, but little of the vinous spirit; and the spirit which is drawn off and poured to fresh salt of Tartar, if it be digested, will hardly gain a Tincture, in as much as it is void of sulphur to unite with the salt.

Now indeed, that in the spirit of Wine, the sulphureous part is distinct from the spirituous, I learned from this Experiment.

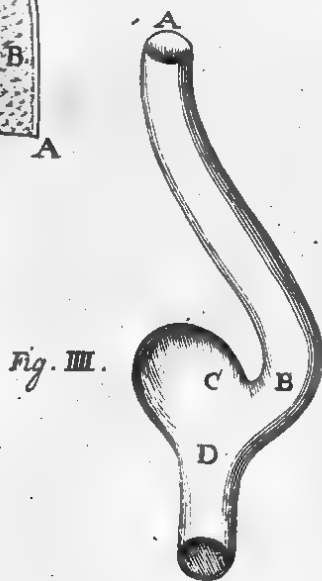
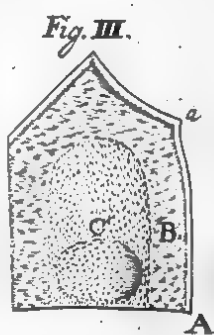
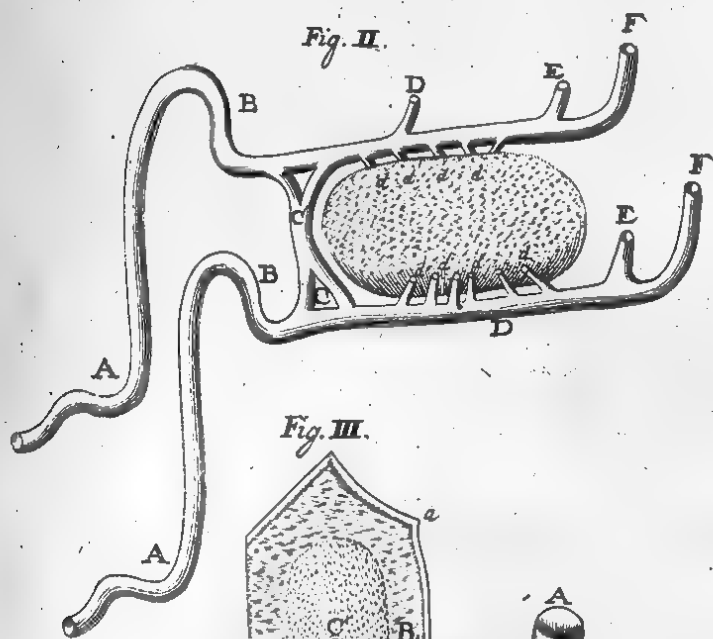
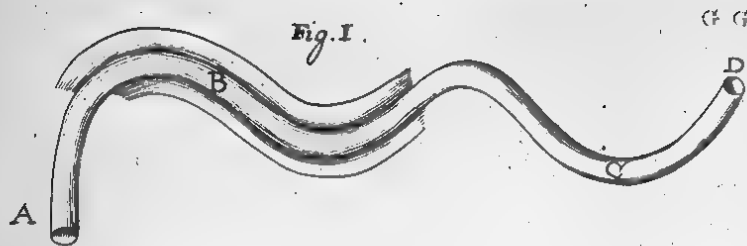
Sulphur or Oil
of Wine.

Take of the sharpest spirit of Vitriol half a pint, of spirit of Wine rectified, one pint; mingle them in a glassen Retort and distil them in an Oven of sand, till the liquor (which at first seems homogeneous or of one nature) being drawn off, a deal of thick sediment remains in the bottom: pour this spirit again to the caput mortuum, and so repeat the distillation with fresh matter two or three times; at last you shall have two distinct, unminglable liquors; to wit, one acid-spiritous that sinks downward, and the other very clear and oily that swims on the top; which, without doubt is the pure and mere sulphureous part of the Wine, separated by it self; whilest the spirituous part joins with the acid salt.

6. Salt of Amber.

Salt of Ambe

Take of the whitest Amber, pulverized lbʒ. distil it in a glassen Retort either with a very strong heat of sand, or a weak heat of a reverberating Oven; first there will arise a phlegm and an yellow Oil with some quantity of spirit; then a volatile salt will



will ascend into the neck of the Retort and sides of the Receiver; and last of all a black Oil will come forth before it ascends: this must be taken out and the Receiver changed, lest the Salt should be polluted by it. Phar. Rat. Part I.

This Salt being at first white, and of a very grateful smell and taste, unless it be kept in a vessel very fast stopped, becomes in a short time yellow, and then grows red and stinks. The cause of which is, because this Medicin contains in it much sulphur; the particles whereof, as long as the salt predominates, being subdued and clogged with others, are altogether obscured; yet afterward, when the composition of the mixed body is loosened, they get out, and shewing themselves above the rest, demonstrate their excellency to several of our senses. The Dose of it is from $\mathfrak{z}\beta$. to $\mathfrak{z}\jmath$. The best way of keeping or giving this Salt of Amber is, if it be mingled with a double quantity of the purest Nitre. The reason of it.

C H A P. III.

Of excessive Pissing, and the Remedy for it; particularly of the Diabetes [or Pissing Disease] into the Theory and Cure of which we here inquire.

THE Diabetes was a Disease so rare among the Ancients, that many famous Physicians have not so much as mentioned it, and Galen never knew above two that were troubled with it; but in our Age, that is given so much to drinking, and especially to guzzling of strong Wine, we meet with very frequent, not to say daily examples and instances of this Distemper. But though it be familiar, and in its appearance well known among us, yet what are the causes and the true nature of it, we are almost wholly to seek. Upon which, that I may venture to philosophize, or rather, give you my opinion, in the first place I shall lay down the description of this Distemper in all its circumstances, or the principal phenomena [or appearances] of it; and then I shall endeavour to find out, from what vitiated part or humour all those arise. The Diabetes was formerly rare, and is not yet well known.

The Diabetes, so called from *διατελυς* [*Diabaino*] *trans eo* [to pass through] is said to be a swift passing of the potent matter [or drink] or a great flux of Urin. Such as are troubled with this Distemper, piss much more than they drink or take of liquid nutriment; and likewise they have a continual thirst, a lingering Fever, and as it were an Hectick always upon them. But as to what several Authors say, that the Drink is little or nothing changed, there is no truth in their assertion: because in all People (that I ever happened to know, and I believe it to be so in all) their Urin was very different not onely from the Drink that they took in, but also from any other humours that are usually generated in our Bodies, being exceedingly sweet, as if there had been Sugar or Honey in it. The occasion of the aforesaid error (I suppose) was from the colour of the Urin, which always looks crude and waterish, as in those that are troubled with the Green-sickness or Dropsie. To find out the reasons of these symptoms, let us enquire first, why the Urin is voided so copiously and so quickly, and then proceed to the remaining causes of this Distemper. The description of it.

Whereas some assign, for the cause of a Diabetes, the attractive quality of the Reins, I do not like their reason; for the Blood is not attracted to the Reins, but is driven thither by the motion of the heart. Nay farther, Neither doth the Serum seem to be drawn out of the Blood whilst it runs through them, or to be, as it were, milked out, but to be separated partly by percolation, and partly by a kind of fusion or precipitation, as I have formerly and clearly shewn. Wherefore I hold that a Diabetes is rather and more immediately a Distemper of the Blood than of the Reins, and that it takes its original from thence, in as much as the mass of Blood doth as it were melt and is too copiously dissolved into serousness; which indeed is very manifest from that vast quantity and great augmentation of Urin, which cannot proceed but from the melting, as it were, and consumption of the Blood. And that is the reason also why the remaining part of the Blood, when the Serum of it flows away so plentifully, grows much thicker and more apt to curdle, as you may conclude from the quickness and strength of the Pulse: for at that time the heart moves more readily; to keep the Blood by an unusual exagitation of it, from curdling. Moreover to continue the fluidity thereof, which is apt to be in great danger through the great expence of serous liquor, they use to drink great quantity of potent matter by reason of their excessive thirst, and likewise the humours that are got into the solid parts, are sucked back by the It doth not proceed from an attraction in the Reins.

But rather from a fusion in the Blood.

Phar. Rat.

Part I.

The immediate
cause of it is
chiefly in the
Blood.

Sometimes part-
ly in the Reins.

This Distemper
proceeds most
commonly from
the dissolution
of the Blood.

Suppression of
the Urin pro-
ceeds from the
compactness of
blood.

It is confirmed
by Anatomical
Observations.

the Blood, yea the very *parenchyma* or stuffing of them, is melted to supply it; in so much that those who are troubled with this Distemper, are very thirsty and consume away for droughth in a short time.

That therefore I may venture to tell you the immediate cause and true nature of the *Diabetes*, I am inclined to believe that the temper or mixture of the Blood is so loosened, and in a manner dissolved, that the watery particles cannot be kept in by the thicker ones, but flying quickly out of their embraces, and being impregnated with salt ones, run out through the most open passages of the Reins. But in the mean time to dilute the Blood, and keep it from curdling, other humours both from without and within too, are drawn to, and mingled with it, and the heart is put always into a far more violent motion.

Yet farther, I think that the Reins also, sometimes are some part of the immediate cause, because their ferment uses oftentimes to be so vitiated, that it cannot keep the Blood by the influx of its lixivial Salt in a due mixture and fluidity, in so much that the *Serum* is separated from it by mere percolation; but it sometimes happens, that the Blood, whilst it passeth through the Reins, is precipitated by an acid Salt that lodges there, (as it were by a kind of Rennet) into a plentiful quantity of *Serum*, which is immediately carried off by the Ureters. Hence you may observe that in many People, who are liable to the Stone in the Kidnies, that when the fit comes they make water clear and in great quantity. The reason of which is, because the acid humour which is brought thither through the nervous passages, and causes the pain (as I have shewn elsewhere) dissolves the Blood that flows into the Reins, and causes a more copious flux of Urin for it.

But it is probable enough that copious pissing proceeds in some measure from the ill conformation or make of the Reins; in as much as the lymphatick or water-pipes thereof are too wide and open, and do too easily receive the serous liquor, and swiftly transmit it without any let or stop, in so much that the greater part of it runneth out into urin. But though I grant that these Pipes or Passages are sometimes, and especially in those that are troubled with the Stone, too wide, yet by that reason the Piss should come away rather bloody than in too great quantity. And indeed I think that pissing of Blood proceedeth principally from such a cause. Moreover when copious pissing and pissing of Blood come together, I am of opinion that an ill temper of Blood, and an ill make of the Reins do concur as causes of that effect; as I shall by and by shew you in a notable case of a person troubled with that Distemper.

In the mean time I do not question but that the principal and most frequent cause of the *Diabetes* consists in the Bloods mixture being too much loosened and dissolved; as on the contrary, in like manner our pissing little, and less than we should do, depends oftentimes upon the constitution of the Blood being too much bound, and as it were, locked up in the vessels. And here it will be convenient to inquire whether the total suppression of the urin doth not sometimes proceed from such a cause? For though it be vulgarly known, that the cause of a strong and obstinate Ichury [or retention of the urin] which is very often seated below the Kidnies, doth altogether depend upon the total obstruction of the urinary passages; and though when I myself have opened many that have died of a total suppression of the urin, I have found in them all, that the invincible cause of their death was the stopping of one Ureter, which a little before was wide open (the other being a long time before quite closed) by a stone newly got into it: Yet the learned Dr. *Riverius* tells us of two cases, wherein two People that were troubled with a total Ichury [or suppression of urin] for several days, and were cured meerly by letting of Blood; and therefore he ascribes the cause of the Distemper to the emulgent veins being excessively distended, in so much that they could not contract themselves to throw out the *Serum*, as we often see it is in the bladder of urin, which being very full, is not easily disposed for discharging the Piss. But indeed, though I believe his Stories, as I ought to do, yet I cannot think I ought to ascent to his reason. For that which this excellent person assigns to them is not the office of the emulgent vessels; for they are not Veins but Arteries, that constantly carry the *Serum* with the Blood, without any danger of fulness or obstinacy of the urin; and when the *Serum* doth not easily run out into the open passages, the reason seems to be, because the mass of Blood being too close and compact, doth not dismiss the watery liquor which is mixed so intimately with it, out of its embraces, without some difficulty.

To this purpose I will tell you of an Anatomical observation lately made upon the body of the Reverend Bishop of *Chester*. When that excellent person, who was long troubled with the Stone, at last died of a long suppression of his urin, immediately all

all People presumed that the cause of his death was a stoppage in his Ureters caused by a Stone or other gravelly matter; but having made a very strict inquiry into it by Anatomy, they could find no obstruction at all in those passages, nor any stoppage of the urin. Such another observation as this, which was not long ago made by himself, Dr. Lower told me of; that is to say, where a mortal Ischury had left no tracks at all of it self about the urinary passages: from whence a man may easily conjecture, that seeing the Reins also were found and well, the cause of the Distemper consisted totally in the excessive concretion and compactness of the blood.

But to return thither from whence we digressed; Now that we have shewn you the immediate cause and true reason of a *Diabetes*, let us proceed to find out the procatartical or more remote and original causes thereof. If therefore you enquire why the constitution of the Blood grows so lax and dissolute, and apt to melt, as it were, into *Serum*, I say, that the fusion of this, just as of Milk, proceeds from the meeting and associating of several kinds of Salt in the mass of it, whereby the other particles, being freed from the saline ones (that separate them from each other, and keep them in a due mixture) divide themselves presently into several parties. Now if you inquire farther how those Salts (by whose private combination we suppose the Bloods mixture to be dissolved, and the fusion of it introduced) come thither; I need not trouble myself long to shew you: for it is very manifest that there are always naturally in the mass of Blood both saline-fixed and volatile particles, to which if there be added an acid or fluid Salt in a good quantity, it will easily cause the aforesaid effect. Hence it is that Rhenish Wine, Cider, and all acid Liquors, if you drink them, cause a more plentiful evacuation by urin than ordinary; and therefore likewise it is, that in some valetudinary or sickly People, whose Blood abounds with an acid Salt, all Medicins impregnated with fixed or volatile Salt are used to provoke urine. Nor doth this Distemper proceed onely from things that we take in, but very often also from humours generated within. You may observe, that a great many, who are subject to Convulsions, before and after their Fits, make a vast quantity of clear water; of which no doubt the cause is, for that the dregs, or refuse of the blood and nervous juice which are gathered together in the solid parts, if at any time, after they are turned sourish, they swell and flow back into the blood, they cause a fusion or dissolution in it, and consequently a great flux of Urin. Wherefore seeing such a flux of the Urin is constant and habitual, nothing can be said more probably, than that the excrementitious humours which are carried out into the solid parts, and after they have contracted a soweriness there, return thence into the Blood, dissolve the liquor of it into too great quantity of *Serum*, and consequently cause such a continual and excessive evacuation.

But for a principal share in this malady, we may justly bring in the nervous juice; for I have elsewhere shewn that this same juice, if ever it degenerates from its right temper, becomes very malignant and hurtful not onely to other humours, but to the solid parts: and that is the reason that from the depravation of this, the mixture also of the Blood is very much in danger to be perverted. But that the nervous juice it self is perverted, we may conclude, because in a *Diabetes* the animal spirits are exceeding fainty, and all nourishment is immediately frustrated.

Moreover, for an extraordinary confirmation of this opinion, I have observed in many People who have been subject to this disease by intervals, that a little before they fell into such a flux of urin, they felt flying, running pins through their whole Bodies, and corrugations, sometimes with dizziness or stinging, and other whiles with frequent contractions or convulsions, twingings of the tendons, and other disturbances and restlessness of the spirits; which was a certain sign that the liquor which moistened the nervous fibres, being degenerated from its temper, and filled with dregs, did irritate or provoke the spirits, and force them into disorders. And then afterward, when the recrements and superfluities of the nervous juice, having gained a fluidity, ran out into the mass of blood and caused a *Diabetes*, the aforesaid symptoms ceased, but then there ensued a languishment in the spirits, and a weakness all over the body.

A *Diabetes* is commonly called *Hydrops ad matulam*, i. e. a Dropsie in the Chamber-pot, and some will needs have both those Distempers to be really the same, and to have the same causes and reason of their being, and that the symptoms in them are varied only according to the measure of evacuating the *Serum*; to wit, that the blood in both Distempers alike being not able to contain its *Serum*, but forced to discharge it by the Arteries, in the one, poureth it forth into the habit of the body and cavities of the bowels; and in the other throws it out into the Reins, to be carried away in great quantity by the Ureters. But indeed, if the thing be more accurately weighed, you shall find a very notable difference between these two Distempers: For an *Anasarca*

Phar. Rat.
Part I.

The original
cause of a Dia-
betes.

As chiefly
acid humours,
that get into
the Blood, and
fnd or precipi-
tate it like
diele.

Such acid hu-
mours proceed
chiefly from the
Nerves and the
nervous parts.

How a Dia-
betes and a Dro-
psie differ.

Phar. Rat.

Part I.

[or Dropſie that runs through the habit of the Body] oftentimes takes its original firſt from the Bloods being weak and too cold, which is the reaſon that it is not ſufficiently kindled and heated, ſo as to perfect aſſimilate and volatilize the chyle which continually comes into it, in ſuch a meaſure as that it may keep it within its embraces whileſt it circulates; but muſt of neceſſity ſpew it out in all places, together with the ſerous liquor, and leave it in the interſtices or diſtances between the Veſſels; and then after, when the Diſtemper grows ſtronger, the blood becomes not onely weak by reaſon of crudities, but being degenerated in its temper, is liable to fluxions and coagulations, and conſequently begets ſerous humours, and that in a greater quantity, pouring them with extraordinary violence into parts that ought not to receive them. But on the contrary in a *Diabetes* the blood is kindled, and heated enough at leaſt, yea many times too much; and concocts the chyle that comes into it very quickly, and beyond all meaſure: beſides that it melts, as it were, the ſolid parts, and ſucks in their meltings, carries them with it round through the veſſels, and digeſts them more than it ſhould do: but yet, when through the concurrence of the Salts, the compoſition of the Blood is quite diſſolved and melted into *Serum*, ſuch portions of it as can get away, being ſeparated within the Reins, run out at the Ureters. If a Diſeaſe like to the *Diabetes*, though inverted (that is to ſay, in which the blood being diſſolved into a ſerous matter poureth forth all its meltings into the whole Body) doth any where at all preſent it ſelf; without doubt it was formerly the epidemical Fever, commonly called the *Engliſh Sweat*; when the Blood melting into a wateriſhneſs, throw out all Humours as well good as bad, even to the expence of the vital nutriment it ſelf, into the pores of the Body, to be by them diſcharged.

The evident
cauſes of a
Diabetes.

Thus much for the nature and cauſes of the Diſeaſe called *Diabetes*; that is to ſay, the immediate and original or more remote cauſes: as to the evident ones, to wit, the occasions whence the acid juices that cauſe the fuſion or coagulation of the Blood, are generated in our Bodies: theſe are of a different kind, and from a different origination. An ill ſort of Diet, and eſpecially a daily and immoderate drinking of Cider, Ale, or Wines that are acid; ſometimes alſo ſadneſs, or long ſorrow, as likewiſe convulſions, and other depreſſions and diſorders of the animal ſpirits are uſed to generate or foment this morbid diſpoſition. I knew a certain perſon who having uſed Rheniſh Wine for his ordinary drink twenty days together, contracted an incurable *Diabetes*; of which, notwithstanding the advice of many excellent Doctours, and whatever Remedies they could uſe, he died in a Moneths time. I remember two Women, who being ſubject to convulſive and hypocondriacal Diſtempers, happened ever now and then to have a great flux of Urin, with languiſhing and conſumption of their ſelf.

The explication
of Symptoms in
a *Diabetes*.
Whence frequent
and copious piſ-
ſing.
Whence a Fever
with thirſt and
conſuming
dryneſſe.

Having already explained the Theory or ſpeculative part of this Diſeaſe, it ſtill remains that I give you the reaſons of the moſt notable ſymptoms in it. Now ſome of theſe I am of opinion are very plain from what I have ſaid; that is to ſay, why in a *Diabetes* the evacuation of the Urin is ſo ſwift and copious: but whereas the Parties troubled with this Diſtemper are feveriſh and very thirſty; the reaſon is partly becauſe the humours and juices wherewith not onely the blood, but the ſolid parts are both moiſtned and reſreſhed, are through a continual drain by Urin exceedingly exhausted; whereupon the jaws are dry, and the heart burns extremely; and partly by the inſtinct of Nature the heart and lungs are forced into more rapid motions, that the blood, being deprived of the *Serum* to dilute it, may be kept from coagulation or concretion, and continued in its due circulation.

Why the Piſs of
theſe that are
ſick of this Diſ-
eaſe is ſweet
like Honey.

But it ſeems more hard to demonſtrate, why the Piſs of ſuch as are ſick of this Diſtemper, is ſo wonderful ſweet, or ſhould taſte like Honey; when rather on the other hand, if according to my hypotheſis, the diſſolution of the blood, and (which is the conſequence of it) the flowing of the urin happens through the combinations of Salts; the liquor ſurely that were impregnated therewith ſhould be ſaltish more than ſweet. But to this I eaſily reply, and ſay, firſt that the Urin is deprived of any ſalt taſte, in as much as ſeveral Salts that are of a different nature are united in it. For this is evident from the manifold experiments among Chymiſts, that when Salts, that are of a different kind (as fixed or volatile) are mingled with an acid, the ſharpeſs of them both is rebated or loſt: wherefore we have no reaſon to wonder that the Urin of thoſe who are ſick of a *Diabetes* is not at all ſalt. But why it ſhould be ſo wonderfully ſweet, like Sugar or Honey, is a knot not eaſie to untie.

A body would think that this effect aroſe from hence; to wit, that not onely the ſreſh nutritive liquor, but alſo the diſſolutions of the ſolid parts were carried off along with the *Serum* that ran out through the Reins; wherefore it ſeems very probable that this ſweetneſs proceeds from thoſe rich juices being mixt with the Urin. But indeed from that mixture there cannot proceed an Honey taſte, but onely a gentle ſoft one like

like that of Milk or Flesh Pottage: and likewise to this, which is not onely grateful, but in some measure poignant too; the saline sharp particles, and the delicate smooth sulphureous ones too (as I have elsewhere shewn) ought to concur. Wherefore as we justly refer or ascribe Sugar and Honey to a concretion of Salt and Sulphur, so we may imagine, that the Urin in a Diabetes is so sweet, because some sulphureous particles taken from the consumption of the solid parts, grow to the Salts that are united in the Serum.

Phar. Rat.
Part. I.

It proceedeth
from a mixture
of Salt and
Sulphur.

As to its prognosticks or fore-knowledge, this disease at first beginning is oftentimes easily cured; but when grown strong upon a man, very seldom and with great difficulty; in as much as the temper of the Blood, being a little loosened, is reduced without much ado, but when it is much dissolved, so that most of its parts separate from each other, it is hardly or never to be restored.

The fore-know-
ledge of this
Disease.

But as to the Cure of it, it seems very difficult in this Distemper to point out the true way of curing it; for as much as the cause of it lies hid in such obscurity, and hath an original so very deep and remote. For as to the common opinion, that the Reins and other solid parts, which contain or transmit the Serum are in fault, in that they too suddenly let go that which is in them, and consequently, that we should chiefly and almost onely insist upon things that are astringent; I say, that not onely Reason but Experience too, do both contradict this supposition and practice; because few or none at all are cured by this Method; and it is highly improbable (not to say, impossible) that such an excess of pissing should proceed from such a cause.

Three Indica-
tions pointing
to its Cure.

Therefore in this Distemper, as in several others, there are three primary Indications or ways pointed out how to cure it; to wit, the Curatory, Preservatory, and Vital. The first of these respecting the Disease, and endeavouring to restrain excessive Pissing, cannot be performed without the second, which aiming at the cause of the Distemper, strives to preserve or restore the due mixture or temper of the Blood. Wherefore in the cure of this Distemper, the chief ways of perfecting it will be, to prevent the dissolution of the Blood, and to remove it, if in any measure already caused. First the fusion of the blood is hindered, if so be that the thicker and more watery parts thereof contain or keep in, and are mutually contained by each other, so that one part do not so continually and speedily separate from the rest; which is brought to pass by remedies that are commonly called *Thickning Medicins*; that is, such whose very viscous or clammy and glutinous particles, being admitted into the mass of blood, do obstinately stick to the active corpuscles thereof, and so separating them from one another, are an hindrance to their floating, and mutually uniting among themselves, or with the saline ones that are poured in from other parts. To this end Rice, White Starch, slimy Vegetables, and also Gums, and some resinous bodies are used to prove good in this Distemper. Secondly, To take off the dissolution of the Blood when it is in any measure caused, you ought to use such Remedies as dissolve concretions of the Salts, so that all the elementary particles that are in it, being again restored to their native circumstances, may recover their former situations, and by that means renew the original temper of the Blood. I formerly told you that this kind of effect is produced in Milk that is curdled by the addition of fixed, volatile, or nitrous Salt, and likewise by the infusion of Spirit of Hartshorn, Sal Armoniack, and the like. Of which (as I have there also intimated) this without doubt is the reason, that whilst the saline-fixed, volatile, or nitrous particles, being put into the Milk in a good plentiful quantity, meet with the acid or precipitatory particles, and are united to them; the other saline ones, which before were bound, being now freed and scattered through the mass of the liquor, may every way disunite and separate the sulphureous and earthy ones that are united among themselves, and consequently, that all the particles being again equally mixed, may contain or keep in, and be contained by each other. How much the Blood, that resembles Milk, is altered by pouring salt distilled liquor into it when it is hot, I have there also declared by Experiments that I have cited. But for the Cure of a Diabetes, we do not easily, or inconsiderately give salt Medicins, because by most men they are looked upon to be always Diuretical; though in the mean time neither reason nor experience contradict this method. For I many times in this Distemper have prescribed the tincture of Antimony with good success, and the Water of slacked Lime, with Shavings of Saxaphras, Aniseeds, Raisins, and Licoris, according to the common Receipt, is by some very highly commended.

The chief in-
tentions of the
Cure:

1. To hinder
the fusion of the
Blood.

2. To remove it
when caused.

3. The Vital Indication is performed by thickning and moderately cooling Diet, and by Cordials that are temperate, and especially by convenient and seasonable hypnoticks or sleeping Medicins, of which some of the chief sorts and choicest Receipts are laid down in the following Chapter, and in the end of this, for a farewell,

3. The Vital
Indication.

Phar. Rat. I thought fit to tell you the Story of a certain Nobleman that was sick of this Distemper whilest I first meditated upon, and afterward wrote this Discourse.

Part I.

A Story.

A certain noble Earl, renowned not onely for the splendour of his Birth, but for the extraordinary qualifications and endowments of his mind, being of a sanguine temper, a florid complexion, and in the very vigour of his Age, (no body knows upon what occasion) became much inclined to excessive Pissing; and when for several Moneths he had been used ever now and then to make great quantities of Water, he at last (it seemed) fell into a Diabetes that was obstinate, strong, and almost desperate. For besides that in the space of 24 hours he voided almost a Gallon and an half of limpid, clear and wonderful sweet water, that tasted as if it had been mixed with Honey; he was likewise troubled with an extraordinary thirst, and as it were, an Hectick Fever, with a mighty languishing of his Spirits, weakness in his limbs, and consumption of his whole body.

When at this time I was sent for to consult with these excellent Physicians Dr. Mitchellwait, and Dr. Witherly, they had prescribed the following Remedies, by the use of which, he in a short time, seemed to grow well again.

An instance of
a Cure.

Take of the Tops of Cypress viij. handfuls, of whites of Eggs beaten together, two pints, of Cinamon 3 ℔. when you have cut them small, pour to them of new Milk viij. pints distil them in the common Instruments, taking care that it burn not: and let the Patient take 3 ℥. thrice a day.

Take of Gum Arabick, and Gum dragant, each 3 ℥. of Peneds 3 ℔. make a Powder, and let him take about 3 ℔. or 3 ℔. twice a day with 3 ℥. or 3 ℥. of distilled water.

Take of Rhubarb pulverized, gr. xv. of Cinamon gr. vj. make a Powder and let him take it in the morning, repeating it within 6 or 7 days.

Take of Cowslip water 3 ℥. of Cinamon-barley water 3 ℥. of Syrup of Poppies 3 ℔. make a Potion, to be taken every night.

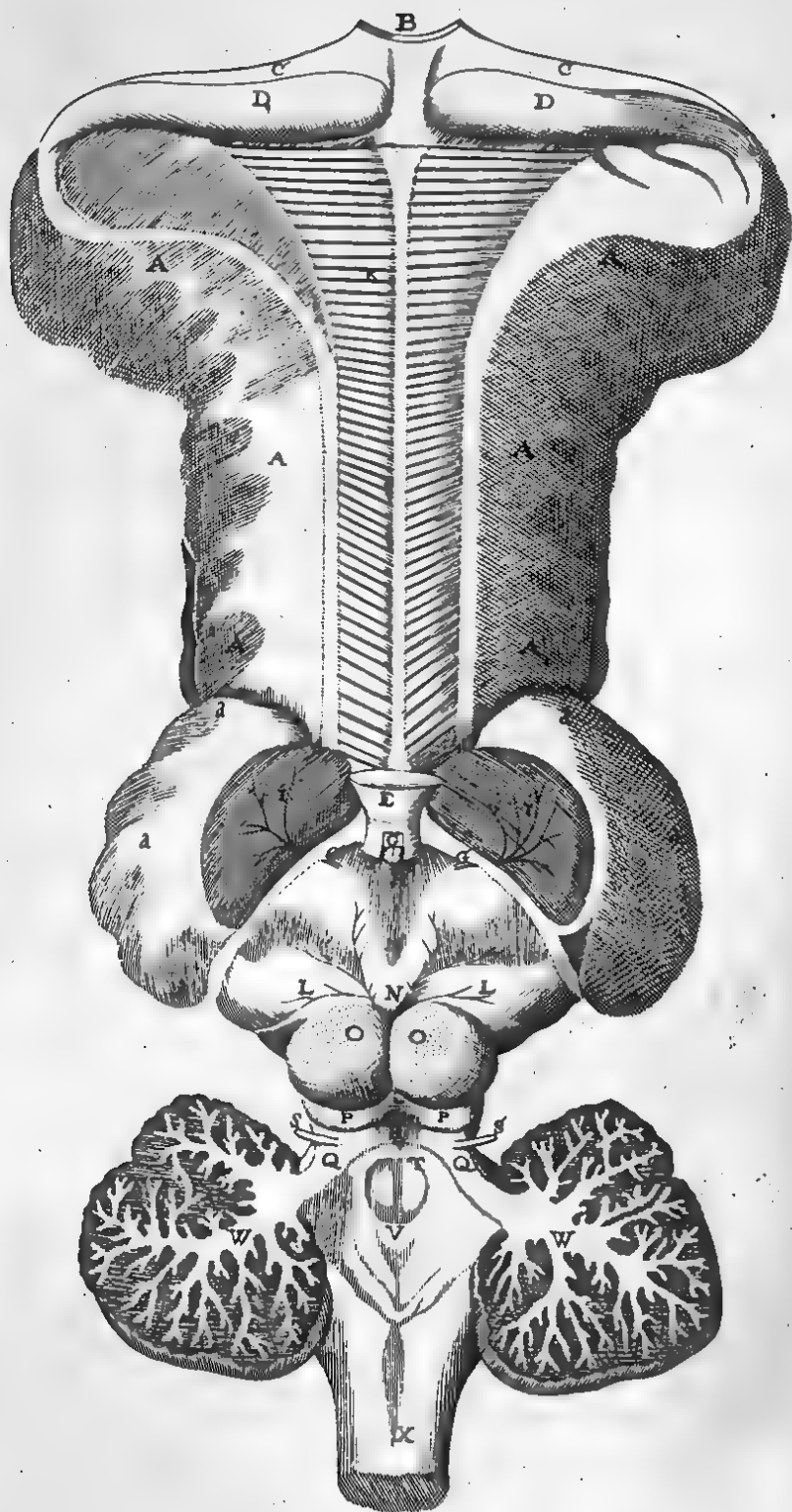
His Diet was onely of Milk which he took sometimes raw, and diluted either with distilled or Barley water, and sometimes boiled with white Bread, or Barley, several times in a day. By the use of these things growing daily better and better, he seemed within a Moneth to be almost quite well: when he began to be pretty hearty, his Urin which was insipid, did not much exceed the quantity of that liquid matter which he took in; and afterward growing somewhat saltish, it was less than what he drank, till at last by degrees recovering his usual tenor of spirits and strength, he returned to his former Diet.

But yet the disposition to this Distemper did not so totally leave him, but that afterward, oftentimes, through disorders in his Diet, and perhaps irregularities in the seasons of the Year, being inclined to a relapse, he made water at first in great quantity, and then clear and sweet, with thirstiness, feverishness, and languishment of his spirits. But by the use of the same Medicins he was usually cured again in a short time. Not long ago, after a long interval of health, a little before he began to suffer his flux of Urin, he underwent great enormities and consumptions in the nervous parts; that is to say, he felt drowsiness and whimsy in his Brain, sudden convulsions in his limbs, twinges of the tendons, and various runnings, as it were of a wind; to and fro. After which when the aforesaid symptoms seemed to be removed by the use of proper Medicins, the Diabetes after its usual manner (that is, when the matter flowed out of the fibres and solid parts into the Bloud, and from thence into the Reins and urinary passages) returned afresh upon him.

About this time the aforesaid Physicians being called to a consultation prescribed almost the same method and remedies as before, by the use of which, being in a few days somewhat better than before, they thought good to prescribe to him water of slacked lime, to be taken thrice a day, by 3 ℥. or vj. at a time; which remedy when he had used four days together, he made water very moderately, that was of a good colour, and something saltish, and seemed in almost all other circumstances, to be as well as ever he had been.

Fig. VII.

HH. p. 77.



CHAP. IV.

Phar. Rat.
Part I.*The several Sorts and Receipts of Medicins that stop excessive Pissing.*

Those Medicins that are properly called Astringents, that is to say, such things as are austere, fower, and styptick or binding, which by wrinkling up the fibres of the bowels, and drawing them into a lesser space, rebate their expulsive and evacuating faculty, and consequently hinder purging both upward and downward, though they are commonly prescribed, yet they do little or nothing toward the restraining of Urin: for their virtue is of no force in the mass of blood, nor doth it at all reach the Reins or the Bladder. Wherefore in a *Diabetes* it is to no purpose that they prescribe the Bark of Pomegranates, Balaustians, Medlars, Roots of Tormentil, and the like; as Reason dictates this, so Experience confirms it. But the Remedies which are found to be of greatest use in a *Diabetes*, and most exactly to square with my Hypothesis, are, as I formerly intimated, of a twofold kind; that is to say, first, such as hinder the combinations of the Salts, and consequently the fusion of the blood; of which sort are those that are commonly called *Thickeners*, and have viscous and glutinous particles, which being admitted into the mass of Blood, stick fast to the active particles thereof, and disjoin them, and keep them from uniting either among themselves, or with the saline ones that flow from other parts. Secondly, Such as dissolve the accretions or unions of the Salts, and consequently restore the mixture of the Blood; of which kind are those saline parts, of another nature, which are apt to stick close to the acid Salt, and by that means to separate it from those combinations that are made within the blood; as are chiefly Medicins impregnated with fixed, and also with volatile and alcalized Salt. Besides these two chief kinds of *Ischuretick* Medicins, there remains another with a secondary sort, to wit, Hypnoticks, or sleepy Medicins; that is to say, such as by putting a stop to the animal motion cause the affairs of living to be carried on much more sedately, and consequently with less fusion of the blood, or precipitation of the serous and nutritive humour. It now remains that I subjoin some select Receipts of every sort of these Medicins.

Astringents do
no good in a
Diabetes.Three ways to
cure it.

i. The first thing that the Physician aims at, that is to say, by thickening the blood to take off, or to prevent the fusion thereof, is attained in manner following.

For thickening
the Blood.

Take of Gum Arabick, and Gum Dragant pulverized, each $\mathfrak{z}\text{ij}$. of Peneds $\mathfrak{z}\beta$. make a Powder, and divide it into 16 parts. Take one part thrice a day, dissolving it in distilled water, or in the decoction of Comfrey roots, in Spring water, or in Milk. A Powder.

Take of resumptive Electuary $\mathfrak{z}\text{ij}$. of the Species of Gum Dragant cold, $\mathfrak{z}\text{ij}$. of red Coral prepared $\mathfrak{z}\text{ij}$. Confection of Jacinth $\mathfrak{z}\text{ij}$. of the Gelly of Vipers skins a convenient quantity; make an Electuary to be taken thrice in a day, the quantity of a Walnut. An Electuary.

Take of the whitest Amber, Mastick, and Olibanum pulverized, each $\mathfrak{z}\text{ij}$. of Pulvis Italy $\mathfrak{z}\text{ij}$. of Balsam of Tolu $\mathfrak{z}\beta$. make a small Powder; whereof the Dose is $\mathfrak{z}\beta$. thrice or four times in a day. A Powder.

Take of the roots of greater Comfrey, and of Water Lillies, each $\mathfrak{z}\text{ij}$. of Dates cut in pieces $\mathfrak{z}\text{ij}$. of the Seeds of Mallows, Cotton, Plantain, and Flea-wort, each $\mathfrak{z}\beta$. boyl them in Spring Water iv. pints to an half; to the straining of it put of the Syrup of Water Lillies $\mathfrak{z}\text{ij}$. The Dose is $\mathfrak{z}\text{iv}$. thrice a day. A Decoction.

Take of the Decoction of Barley, with roots of Water Lillies one pint and half, of Sweet Almonds prepared $\mathfrak{z}\text{ij}$. of Seeds of white Poppies, Pursley, and Lettice, each $\mathfrak{z}\text{ij}$. make an Emulsion according to Art. The Dose is $\mathfrak{z}\text{iv}$. thrice a day. An Emulsion.

Take of the tops of Cypress m. vi. of the leaves of Esalarea m. iv. of the Flowers of Archangel or white Nettle, of Comfrey, and of Water Lillies, each m. iv. of the roots of Water Lillies and Comfrey, each lb. of Mace $\mathfrak{z}\text{ij}$. when you have shreded them altogether very small, pour to them of new Milk viii. pints; distil them in the common Vessels. The Dose is $\mathfrak{z}\text{iv}$. thrice a day, with the Powder or Electuary before prescribed. A distilled wa-
ter.

Secondly,

Phar. Rat.
Part I.

The reduction
or fixing of the
bloud.

Secondly, Although salt Medicins of every sort and state are looked upon to be diuretical, and every one of them in some cases, as far as they dissolve the blood, and cause the serous parts of it more copiously to separate, are in some measure really diuretical, for this reason, though the use of them in a *Diabetes* may be justly suspected, yet upon the account of what I have before said, to wit, that by meeting with the acid Salt (when it predominates in the blood) they take off and prevent the fusion and melting thereof, I do not at all question, but that sometimes they may be given with success for the stopping of immoderate evacuations by Urin; and as soon as ever I have an opportunity, I am resolved to try the truth of this by a cautious experiment: and indeed that such an experiment may be with safety made, is manifest enough from this, that I have heard for a certain of one who was cured of a *Diabetes* by an infusion of slacked Lime. But because those saline Medicins (which we suppose do either take off, and as it were fetter the acid Salt) are impregnated with fixed, or volatile, or alchalized Salt, I will cite some Receipts of *Ichuretick* Medicins, in which each of these are the foundation.

Medicins im-
pregnated with
fixed Salt.

First therefore when fixed Salt by it self, or joined with Sulphur, is required for the foundation.

Tinctures.

Take of the Tincture of Salt of Tartar, or the Diliquium of it, a convenient quantity; give it in a small draught of the Decoction, or distilled Water just now prescribed thrice a day.

Take of the Tincture of Antimony, and give it the same way thrice a day. I know by frequent experiments that the use of this is very advantageous in this Distemper.

Take of the Salt of Coral \mathfrak{z} j. to be given in the same manner.

An Infusion.

Take of the infusion of slacked Lime one pint. The Dose is \mathfrak{z} iij. or \mathfrak{z} iv. thrice a day, giving first of all a Dose of the Electuary or Powder before prescribed.

An Electuary.

Take of Conserve of the Flowers of Archangel, and the greater Comfrey \mathfrak{z} iv. of the reddest Crocus of Iron \mathfrak{z} β . of Coral calcined to a whiteness \mathfrak{z} ij. of Syrup of Comfrey a convenient quantity: make an Electuary. The Dose is \mathfrak{z} ij. thrice a day.

A Powder.

Take of Lapis Specularis calcined \mathfrak{z} j. The Dose is from \mathfrak{z} β . to \mathfrak{z} j. twice or thrice a day.

Country men with this Medicin do very successfully cure their Cattle that are troubled with pissing of blood.

Take of Coral calcined to a whiteness and pulverized \mathfrak{z} iij. of Powder of Gum Arabic and Gum Dragant, each \mathfrak{z} j. make a Powder, and divide it into 10. parts, whereof take one, thrice a day in a convenient vehicle, to wit, the Decoction, or the Distilled Water.

Take of the reddest Crocus of Iron \mathfrak{z} vj. of Gum lac. pulverized \mathfrak{z} β . of red Saunders \mathfrak{z} j. make a Powder, and divide it into 20. parts, of which take one thrice a day.

A Decoction.

Take of Harts horn burnt and pulverized \mathfrak{z} β . boil it in iv. pints of water wherein Iron is quenched till it waste to half, then add at the last a crust of bread, and of the roots of the greater Comfrey, and of dried Water Lillies, each \mathfrak{z} j. β . to the straining whereof put of Sugar of Pearl \mathfrak{z} ij. Let the Patient take \mathfrak{z} iv. thrice a day.

Medicins im-
pregnated with
alchalized Salt.

2. Medicins impregnated with alchalized Salt, such as Corals, Pearls, Cuttle bone, Harts horn, Ivory, Powders of Shells, and the like, are very commonly used, not onely against Rheumatical Distempers, but also in a *Diabetes*, and indeed according to my Hypothesis, in as much as they receive the acid Salt which abounds in the blood, and consequently free the mass of blood from dissolution; you may from them expect benefit, and that most commonly with success.

A Powder.

Take of red Coral ground very small, and of Cuttle bone, each \mathfrak{z} β . of Harts horn philosophically calcined \mathfrak{z} iij. of Pearl, Ivory, and Crabs Eyes, each \mathfrak{z} j. mingle them and make a Powder. The Dose is \mathfrak{z} β . thrice a day in a convenient vehicle.

Take

Take of the same Powder \mathfrak{z} iij. of the Species of Gum Dragant cold \mathfrak{z} ij. of Sugar Candy \mathfrak{z} ij. *Phar. Rat.*
make a Powder, with a convenient quantity of the dissolution of Gum Arabick, and make *Part I.*
a Paste. Form it into Trochies of the weight of \mathfrak{z} β . of which take iij. or iv. thrice or
oftener in a day.

Take of the same Powder \mathfrak{z} iij. of resumptive Electuary \mathfrak{z} iv. of the Conserve of the Flowers *An Electuary.*
of Water Lillies \mathfrak{z} iij. of the Syrup of the same a convenient quantity, and make an Ele-
ctuary. Let the Party take the quantity of a Chesnut thrice a day, drinking thereupon a
draught of the Apozeme or distilled Water before prescribed.

3. For the same reason that Medicins impregnated with fixed and alchalized Salt *Medicins im-*
seemed good to cure a Diabetes, those also that have volatile Salt in them may con- *pregnated with*
duce to the same effect. For the latter as well as the former receive and separate the *volatile Salt.*
acid Salt (whereby the blood is dissolved and melted into a ferousness) and conse-
quently the liquor thereof recovereth its due temperament.

Take of Tinctura Solaris with Sul Armoniack (prepared as I use easily to do it) \mathfrak{z} j. *A Tincture.*
Dose is 20. drops thrice a day: Spirit of Blood, Soot, Harts horn may also be tried in
this Distemper.

Take of the Salt of Amber \mathfrak{z} j. of the reddest Crocus of Iron \mathfrak{z} ij. mingle them, and divide *A Powder.*
it into 12. parts. The Dose is one part thrice a day.

As to the third sort of Remedies against a Diabetes, that is, Hypnoticks; which by *Hypnoticks.*
stopping the animal Spirits, retard the course of the blood, and consequently some-
what hinder the boyling and dissolution thereof; I use in some cases to prescribe Dia-
codium, to be taken every Evening; and if at any time that doth not do the business,
to give Liquid Laudanum, prepared with Quinces or tartarized, sometimes every
night, and sometimes every other night with good success.

Take of the Decoction of Barley, with \mathfrak{z} β . of the roots of dried Comfrey \mathfrak{z} vj. of white Poppy
Seeds \mathfrak{z} ij. of sweet Almonds prepared in number vj. and make an Emulsion according to
Art, to be taken each night when you go to bed.

Take of the Misistrat Water before prescribed \mathfrak{z} iij. of the dissolution of Gum Dragant \mathfrak{z} ij.
of Diacodium \mathfrak{z} β . to \mathfrak{z} vj. to be taken at night, when you go to sleep.

Take of the Conserve of the Flowers of Water Lillies \mathfrak{z} ij. of Laudanum tartarized or pre-
pared with Quinces \mathfrak{z} j. of the Tincture of Saffron drops vj. make a Bolus, to be taken
when you go to sleep.

Phar. Rat.

Part I.

SECT. V.

CHAP. I.

Of Sweating and Medicins that cause evacuation thereby.

One way to
take in, but
many to let
things out of
the body.

The reason of it
is intimated.

Phyſick ſupplies
the defect of na-
tural evacua-
tions.

How Sweating
differs from
Purging.

The matter of
Sweat is either
Elementary or
Humoral.

I. What are the
particles of the
ſerum.

For the nourishment of the Bodies of Animals, their food is taken in onely one way, that is through the mouth; but provident Nature hath made many outlets or ways for evacuations, through which the baser parts of the nourishment or any disagreeable particles, whether they come from without, or are generated within, are thrown forth. Indeed it was convenient that all the food should enter at the same door; to wit, that it might be sufficiently distinguished and examined; for if there were many, or Back-doors that opened inward, there might poisons easily creep in with the meat. Now, if against the intention of this single avenew, any hostile matter gets in, or through the failure of good management within, be ingendered there, this cannot lie hid in any retiring room or corner, but that there are in that same place some loop-holes open for the discharging of it. For if any heterogeneous matter lodgeth in the first passages, it is voided by Vomits or Purging; but if it go further and mingle with the blood or nervous liquor, or stick to the solid parts, it is immediately thrown out by Transpiration, and Sweat, or by Urin. Again, If Nature, as being slothful, or hindered, doth not carry off extraneous things of its own accord, or quickly, or in sufficient quantity by these ways, then Phyſick supplies us with Remedies very necessary, to supply the defect or faults that are in the manner of evacuation or passages whereby it is, or ought to be performed. As therefore I have treated very largely in the former Chapters concerning Vomiting, Purging, and Pissing, and shewn by what dispositions of the Humours, Spirits, and Bowels, Medicins designed for those ends produce their operations; so now in the next place I must explain to you, how and by what Medicins extraordinary Sweating, if there be at any time occasion for it, is usually provoked. Now for the better explication hereof, I must first declare to you what is the matter and true nature of Sweat, and in what, and how many manners Sweating oftentimes happeneth without Phyſick, through external accidents, or the inward commotions of the Humours or Spirits.

In Sweating, quite contrary to what it is in purging, the motion of evacuation tends from the first passages, and as it were the center of the body to the circumference; and in both these cases the Arteries carry more to the places of evacuation than the veins bring back, whilst in the mean time from places that are opposite to them, the veins bring back more than the Arteries carried thither. In a Purge, there is a greater burden imposed upon the splanchnical or bowel Arteries and Veins too, that relate to the habit of the body: but it is quite contrary in Sweating; for in this case whilst the Arteries carry the matter more than usually toward the outside of the body, the mesaraick veins carry away a greater quantity from the Bowels made for concoction, than the Arteries brought thither. So likewise in the other evacuation, whilst the splanchnical Arteries pour more than ordinary into the bowels, the outward veins bring back more from the habit of the body than the Arteries leave there. Wherefore as both these evacuations are caused several ways, so, not least of all in this manner; to wit, whilst the Arteries that belong either to the Bowels, or to the habit of the body, are put upon more rapid motions than ordinary, a greater load of Humours will be thrust into the Veins that are of the opposite side. How sweating Medicins perform both these intentions I shall tell you by and by. In the mean while concerning Sweating in general, I shall observe, that Sweating, in respect of perspiration, is just like a Lask in respect to the natural and ordinary way of evacuation; that is, it is onely a more swift and a stronger kind of perspiration. For whenever the blood boiling up more than ordinary, and being as it were put into a flame, doth more copiously emit or send forth its hot particles, those particles conveying along with them certain parts of the Serum cause Sweat.

The matter of Sweat may be called either Elementary or Humoral; and as to the former, that as well as Urin consists of a moderate spirit, salt and sulphur, a great quantity of serum, and a little earth. And that it is so, is easily gathered from the loss of spirits in sweating, the watery substance of this Excrement, the salt taste, unctuousness

nefs and feculency thereof. For whilest the blood (in order to prolong the life of *Phar. Rat.* Animals) is continually kindled in the Lungs, and then breaking forth, as it were, into a flame, is hurried out of the heart through the Arteries into all parts certain subtile particles, that is to say, spirituous and sulphureous ones, as being most apt to fly away, do in great plenty depart out of the liquor thereof, when rarefied and kindled; which particles flowing through the pores of the body, carry along with them many small portions of the *Serum*, and some also of the other Humours at the same time. Now if these kind of *effluvia* or emanations are few, they fly away insensibly, and exhaling moderately, vanish into the Air, so as that you can hardly perceive them; but if they are more numerous and break forth in great quantity, they are condensed or thickned into water, whilest they scarce pass through the pores of the skin, just as when vapours sent forth from boyling water, moisten the pot-lid.

2. The Humoral matter of the Sweat is ordinarily scarce any other than the serum *what the second consists of* of the blood, to which sometimes, if the evacuation that way be inordinate, there are added some portions of the nutritive and nervous juice; with other humours gathered out of the bowels, glandules and lymphick or watery vessels, yea, and likewise the substance or meltings of the solid parts: but yet whatever it is, it is voided chiefly out of the Arteries, though I do not deny that besides that, there does some of it come out of the nerves too; so also that out of the fibres and solid parts something of an humour is attenuated by the force of the heat into a vapour, which upon the skin thickneth again into a moisture. But notwithstanding it is the blood onely that by its heat makes any humour evaporate, and from its own bosom sends forth the greatest part of that which sweats out.

To the end that Sweat may break forth in great quantity and easily, these three things are requisite; that is to say, First, That the blood, when boyling up more than ordinary, should circulate more rapidly than it usually doth: Secondly, That the watery part of it should abound with many aqueous particles, and those loosened, that is, apt to be separated from the rest of the liquor, and changed into a vapour. Thirdly and lastly, that the pores of the whole body be set wide enough open.

1. The reason of the first condition seems manifest enough; for unless the blood circulate rapidly, and be carried through the Arteries in so great a quantity, as that what remains above that which the Veins bring back again, cannot be wholly received in the lymphick vessels, or exhaled by insensible perspiration, there will be nothing superfluous, to transpire by sweating; for the liquor of Sweat consists of the superfluous and rejectaneous matter of those passages. But the blood circulateth more rapidly, in order to the producing of Sweat; in as much as through the more frequent and vehement compressions of the heart, it is driven about with a greater force. Of which effect, though there are several manifest causes, they may all, or at least the chiefest of them, be reduced to the two kinds following.

For the actuating and variously altering the motion of the heart, the efficient cause are the animal Spirits that flow to it from the Brain; but the final cause is the circulation of the blood: for as upon that account the motion of it was first ordained, so according as the blood ought to circulate, upon several occasions, sometimes swifter and sometimes slower, fiercely or quietly, or any other way, the beating of the heart also is variously altered. Whenever therefore that is augmented or quickened so, as that it causes sweating, it comes to pass either through necessity or indigence of the blood, or the instigation of the animal spirits.

1. Whenever the blood is heated, or kindled more than ordinary, it ought to be carried about more rapidly than is usual, lest it should be choaked within the folds of the heart. Now of such a boyling or excessive kindling thereof, there are many causes and occasions. For the blood sometimes swells of its own accord, like Wines, by its own sulphur which is too much elevated. Moreover when it is exceedingly tossed or heated, and more than ordinarily kindled by hot things taken in at the mouth, through the ambient heat, a swifter motion of the body, shutting of the pores, or other occasions, it requires to be carried about so rapidly, to the end that it may cause sweating.

2. Sometimes the blood, though quiet of it self, is put into an Hydrotick effervescence or sweating heat, by the instigation of the animal spirits. For in acute Pains, violent Passions, great stoppages of the natural or vital Functions, in the very agony or pangs of death, and other faintings or disorders of the spirits, where the health of the body is in great danger, the sensitive soul (to keep the vital flame of the blood from going out) puts the heart into a very rapid motion, whereby whilest the blood is driven about with greater violence, it also causes for the most part sweating.

The second thing required in order to cause sweating is, that whilest the blood boyls

Phar. Rat.

Part I.

2. The second condition of Sweating is, that blood be loose and dissolved.

3. The third condition is, that the pores be wide enough.

The causes of excessive Sweating are intimated.

1. Of which the first is, an ill temper of the blood, or a weakness in it, &c.

2. An obstruction of the passage of the Serum the usual ways.

The third is openness of the Pores.

The true nature and immediate cause of Sweat.

The remote causes of it.

up very exceedingly, or is kindled more than usually, and sends forth great quantities of *effluvia* or streams from it, its liquor should abound with a serous humour, which may be also apt to separate and exhale from the other part of its mass; for otherwise there will break forth onely a dry vapour as from boiling Oil (though in the heat of a Fever, or any other great heat) and not at all any sweat. But they whose blood being full of *Serum*, if of a loose and somewhat dissolved constitution, are put into a sweat upon every the least occasion. But if the *Serum* be defective, or is not easily separated from the blood, as being too compact, or through the feculency that is in it, very thick; though a burning Fever come upon him, and at the same time the strongest sweating Medicins are administered, the Party shall hardly sweat at all.

Thirdly to procure sweating the right way, it is requisite that when the blood boils, and is diluted with an aqueous humour, which is easily separable from it, the pores of the skin also should be wide and open enough; for unless the body be perspirable, it is in vain to attempt sweating. Some mens skins are very thick, and almost impenetrable, to which if the Winters cold comes, you may sooner draw water out of a pumice stone than out of their hides.

So much for the chief requisites toward the cause of sweating, which as they are sometimes partly deficient, in so much that the sweat comes very hardly or not at all away; so sometimes through the excess of these requisites, as likewise through some other inordinacies in the humours or habit of the body, too frequent and copious sweating doth usually infest some persons, so far that the nutritive juice is no sooner conveyed into the blood, but immediately all of it sweating forth with the serous liquor out at the pores of the skin, is turned to a moisture. The reason of which, if we inquire into, there are these three things chiefly, in some or all of which they seem most chiefly to consist.

1. Therefore a too excessive inclination to sweating arises sometimes because the blood being vitiated in its temper, and made too weak, cannot assimilate the nutritive juice, which it receives out of the chyle: wherefore, as a Stomach, whose tone is relaxed, it is forced to vomit out the humour which is poured into it, as soon as it is full of it. Hence it is that most commonly nocturnal sweatings, which are very troublesome, succeed Fevers in the day time; in as much as that in these the mass of blood (like sower Milk which being heated over the fire is dissolved and precipitated into a wheyishness of its own accord without any thing to turn it put in) is of so loose a constitution, that it is loosened in its mixture upon any light occasion. To which you may add, that the blood being impoverished is not fully kindled, whereupon the crude juices, by how much the less they are consumed by efflagration, must of necessity break forth by sweat so much the more copiously whilst the blood is put into a brisk motion.

Secondly, It is not improbable, that an excessive inclination to sweating may depend in some measure upon this cause also; to wit, that either the veins or lymphæducts do not in all places discharge their duty as they ought to do. For if perchance the serous superfluities of the Arterial blood, are not immediately taken out one way or other, they must of necessity be somewhere gathered together to a great fulness, and consequently, if they are not evacuated by sweat, must needs hinder the circulation of the blood, and oftentimes cause a Dropsie.

Thirdly, If at any time, for the reasons aforesaid, the inclination to sweating grows strong upon a man, the same also is augmented, and frequent and copious sweats flow forth, if the pores and passages of the skin are wider than they use to be: which disposition sometimes is natural, and sometimes contracted by accident. I have known some mens bodies so pervious and open that they could not indure so much as the lightest blast of Air; who likewise through any violent motion, or heat of the Sun, Fire, or their Beds, would presently dissolve into a sweat.

From these things (which are necessarily required for the causing of sweat, and make it excessive) thus laid down, it will be easie to collect what is both the true nature of Sweat, and also the immediate cause of it: for both consist in this, that the blood abounding with *Serum*, and being somewhat loosened in its constitution, whilst it is more rapidly carried about by the brisker pulsation or beating of the heart, and by that means more is carried forth through the Arteries, than that the bloody part can be all strait brought back by the veins and the serous part discharged through the reins and lymphæducts, there is therefore a necessity that whatever *Serum* remains, impregnated also with other particles, should sweat out through the pores of the skin which are wide enough to admit it.

As to other causes of sweating, to wit, the original, or remote, and the evident ones; those of the former sort respect either the mass of blood, or the animal spirits. For these

these being (as I formerly hinted) obnoxious to convulsive indispositions and other irregularities, do sometimes of their own accord, or occasionally put themselves into explosive and inordinate motions; whereby the heart also being exceedingly disturbed, drives the blood about with greater violence, and consequently causes them to melt into sweats. But the antecedent cause of spontaneous sweating lies oftentimes in the mass of blood: for if at any time heterogeneous and foreign particles, or such as are altogether disagreeable, are gathered together to a fulness within the body of it, then finding it self oppressed, it is presently dissolved, and boyls up, to separate and throw out by way of sweating whatever is troublesome to it, together with the serous liquor. Which kind of Sweat, according as the peccant matter is easie, difficult, or impossible to be voided, is called either Critical (which is also more or less perfect) or symptomatical. Of these I have discoursed at large in my Treatise called *Puretologia* [or *A Discourse of Fevers*,] so that I have no need to say any more in this place.

2. The evident causes of Sweat, that is, such as without any original cause or physical Indication, cause sweating very often, solitarily and by themselves, being various and of divers kinds; to wit, such things as are taken in at the mouth, things outwardly applied, too great a commotion in the mind or body, with many others; I have a mind in this place briefly to observe to you the chiefest of them, together with their distinct manners of working: which when you rightly understand, it will be the more easie to conceive how and with what difference the Medicins that are designed for this purpose cause that purgation by sweat.

1. First therefore Sweat is usually produced by a more violent, laborious, and long motion of the body; as we see daily in Running, Dancing, carrying of Burdens, Drawing, and the like. The reason of which is, because the muscles of the whole body being violently exercised, compress the Vessels that are between them, and consequently put the blood into a commotion, driving it rapidly to and fro; and seeing that by this means the veins are chiefly straightned, the blood glides the more easily through their cavities, which are still wider and wider, and is much more swiftly carried toward the heart; and seeing the blood in that manner being gathered to a great quantity within the right side of the heart, oppresseth, or almost choaks it, both the heart and lungs labour very vigorously with more frequent and stronger endeavours to drive the blood about more rapidly, that so at last it being more inflamed within the heart, and consequently rarefied and dissolved, or loosened in its constitution, may exhale a great many more particles of heat, that is, of spirit and sulphur; which conveying out along with them the serous parts, that (whilest all the vessels are so swollen) cannot be brought back again, make the Sweat. As in the body, so in the mind also, immoderate exercises cause sweating.

2. The ambient heat [or heat that encompasseth them] as of the Sun, Fire, a Bath, an Hot-house, and the like, is apt to provoke sweating; because the hot particles that are conveyed into our bodies from without, and enter under the skin, do not onely open the pores and passages thereof, but also make the blood to boyl, and bubble as Water doth over a fire; in so much that when the constitution thereof is loosened and rarefied the sweaty vapours fly out in great quantities. Nor is it the external heat alone, but even our own, which being detained about the surface of that body, from whence it exhaled, causeth sweat. For nothing is more usual than for a man when he lies in bed, being covered with a great many cloths, to fall into a sweat. The reason of which is plain enough, in as much as the vapours or breathings which just then come from him, and are restrained or kept in about the surface of his body, have the nature of a dry Bath.

3. The hindering of usual Transpiration doth sometimes cause sweating; and the reason of which is, because the blood being restrained from its free and usual perspiration, fermenteth more violently, like new Wine put up too close in any vessel; and consequently being the more rarefied, and put into a great commotion through its more rapid circulation, must of necessity be dissolved into Sweat. It was anciently a custom among the *Irish* when they were sick of any Fever, to wrap themselves up in woollen clothes, moistned with cold Water, by which means great quantity of Sweat came from them, and oftentimes cured the Distemper. I have heard of such an Experiment as this, that hath been tried upon our Country People with good success.

4. Hot Meats inwardly taken, especially such as are seasoned with Salt, Pepper, and Spices, and so also drinking of hot Waters, strong Ale, and generous Wine, in as much as they either impregnate the blood with active particles, which are like Spurs or Gladi- flies to it, or supply it when it is inflamed with Sulphur and such combustible matter, which is like Oil to a Lamp, they cause a more copious perspiration of the exhala-

Har. Rat.
Part. I.

The evident causes of Sweat,

1. Commotions in the Body:

Or in the Mind.

2. The ambient heat, or heat of the Air, &c.

3. Hindering of usual Transpiration.

4. Hot things taken inwardly.

Phar. Rat.
Part I.The difference
of Sweats.The causes of a
cold Sweat.How Sweating
Medicins ought
to be qualified.The general
reason of their
operation.

ble matter, and consequently greater exudations or sweatings out of the superfluous Serum.

So much of the Nature and Causes (as well conjunct as manifest) of Sweat. As to the differences of it, it uses to be distinguished several ways; to wit, that is either spontaneous or forced; either partial, or universal; either critical or symptomatical; the reasons of all which are very manifest from what I have already said.

Moreover Sweat is either hot, of which I have treated hitherto; or actually cold; such as is caused by a Panick fear, very sharp pains, in a Lipothymie, or any sudden fainting of the spirits, and in the pangs of death. The cause hereof seems to consist in the whole Souls sinking upon any sudden and extraordinary passion, whereby it contracts its circumference; and consequently, when the spirits are put into a consternation, and the blood retracted with the heat toward the heart, the outmost particles that flow out through the skin, being left or forsaken by those that follow, and destitute of heat, are immediately condensed into a cold vapour just as it usually happens in Distillation. For if you restrain, or put out the fire on a sudden, the hot exhalation, that fills the Still, will presently turn to a Water.

From these things thus premised and demonstrated, which are the chiefest requisites to provoke sweating, and the great occasions, or ordinary accidents upon the account of which it is usually excited; it will not be any difficult matter to shew you in what qualities and particles sweating Medicins ought to excel, and after what manner they produce their effects. And first of all, as to their Virtues, Sweating things that are to be taken inward ought to be such as may make the blood boyl up more than ordinary, and by consequence, evaporate; and likewise such as may in some measure open and dissolve the mass thereof, which is oftentimes too compact and thick; so that the serous part thereof may the more easily separate and run away; and at the same time may dispose it when so separated for evacuation by sweating, rather than by urin or stool. These are two things that are primary Requisites or Indications to Sweating; for the right accomplishing whereof, Diaphoreticks or sweating Medicins of several kinds and operations are commonly used. As to the third Requisite (which I mentioned before) to wit, the opening of the Pores, it is performed almost by outward Administrations onely; but after what manner, and how many ways it is usually brought about, I shall shew hereafter. In the mean time, to speak of Hidrotick or sweating Medicins that are to be taken in at the mouth, I must first shew you, after what general manner such Medicins work; then with what difference and particular kind of operation; and lastly, by virtue of what qualities, in every kind, to wit, either of the whole mixture, or any one single element, that is to say, a Spirit, Sulphur, or Salt, they exert their powers both in the bowels and in the humours, when they provoke Sweat.

I. Therefore as to the first, concerning sweating Medicins in general; I observe that they consist of such particles, as being benign enough to the Stomach and Guts, do not cause in them any convulsion or motion to stool: and likewise that they cannot be subdued by them, or assimilated as food may be; but when they come into the stomach, immediately dispose both the animal spirits and the blood to sweating. For some of them being drowned and dissolved in the stomach, do presently rouse and recreate the animal spirits that abound within the nervous fibres (out of which the inner coat is made) in so much that the substance of the whole sensitive soul being presently erected, and expanded or spread to a larger circumference, makes the heart more vegete and active, and consequently the blood, which is rarefied and more in-kindled, more rapidly to circulate, by which means it is put into a Sweat. Moreover, in the mean time the particles of the same Medicin convey themselves also into the blood that runs through the stomach-vessels (which cover the nervous tunick or coat in great numbers) and force it (by putting it in a ferment and a sudden heat) to make its way through the Veins toward the heart with far greater speed than ordinary: into which when it comes with that violence, immediately the pulse of the heart is augmented, and the whole mass of blood being rarefied and more inflamed, and at the same time disturbed by the particles of the Medicin that are most intimately mixed with it, it is hurried on through the arteries with far greater speed into all outward parts; where, seeing all its watery part cannot be brought back or received by the veins and other conveyances, it must of necessity come to pass, that a great part of the serous humour be melted into Sweat. But the particles of the sweating Medicin, being admitted, as is aforesaid, into the blood, do not onely ferment and disturb the liquor thereof, but oftentimes also do so loosen and open the mixture of it, that the Serum and other dreggy parts of it are the more easily separated and thrown off. But since this happens to fall out after a different manner, not onely according to the various con-

constitution of the blood, but the several operations or preparations of the Medicin, it seemeth worth our while in this place briefly to give you the various Indications when you ought to use sweating Physick, and the different ways of prosecuting them, together with the reason of every one of them. But upon this subject you must first take notice, that sweating Medicins are, in the ways of their operations, and the operation it self very nearly allied to a great many Cordials (as they are commonly called) in so much that many of both sorts are of the same or reciprocal use; and therefore seeing they differ chiefly in their greater or lesser efficacy, as often as you have need to pass from one kind to the other, it will be almost onely necessary to augment or diminish the Dose, and to chuse the most convenient times to give it in:

Therefore, as to the various kind and preparation of the matter out of which Hydrotick or sweating Medicins are compounded, they are most commonly either the Integral or Elementary parts of some mixt body: that is, they are either natural bodies, that are given in their whole substance, either simple or extracted; as when the Leaves, Seeds, or Roots of Carduus, Contrayerva, Angelica, or the like, are taken in a Powder, Decoction, Conserve, or Magistery: or else sweating Medicins consist of the particles of this or that Element, which are spirituous, sulphureous, saline, simple, or any other that predominate therein: as if you extract out of Carduus, or any other body, whether Vegetable, Mineral, or Animal, a Salt, or Spirit, or Oil, and reduce it apart by it self, or with other preparations, into the form of a Medicin. I shall briefly touch upon each, or at least, the chiefest sorts of them.

I. *Diaphoreticks*, whose virtue consists in the Integral particles of the whole concrete body, being unequally mingled, seem to excel in one particular Element, (that is, Salt) above all others, and to owe their virtue chiefly to that. But that Salt, upon which the Hydrotick or sweating quality depends, comes in double capacity; for in some bodies it is volatile, sharp, or bitter; and in others Alchalis'd, or in some measure fixed. 1. In the first rank are placed many Vegetables, which the Ancients counted Antidotes, as the Leaves of Scordium, Carduus, Scabious, and Vincetoricum, or Celandine, Marigold, and Camomile Flowers, Lagwort, Zedoary, and Galangal roots, &c. as also the Confections of Mithridate, Treacle, Diascordium, and likewise Decoctions of Guaiacum, Box, and such like. Which kind of Medicins, when taken into the Stomach and dissolved, make a Tincture, whose particles (as being more hot than ordinary, and exotick or foreign) rouse up the animal spirits, whereby the heart being more vegetely actuated, drives about the blood with a more rapid motion. Besides which they get into the blood that is in the stomach vessels, and ferment it, and by that means, whilest they cause it to be brought back to the heart by the veins in more than ordinary haste, they are also the occasion that it is driven forward so vehemently through the Arteries into the habit of the body, and causeth sweating. 2. The other sort of Diaphoreticks, or sweating Medicins, which consisting of the integral parts of a mixt body, have an alchali Salt predominant in them, are Stones, and the bony or harder and shelly parts of Animals and Vegetables, as Bezoar, Pearl, Eyes and Claws of Crabs, and the like, whose Diaphoretick virtue proceeds most chiefly from an Alchali Salt; in as much as the particles thereof meeting sometimes with an acid Salt, not onely in the bowels, but in the blood too, and boyling up with it, do thereby cause the mass of blood to dissolve, and the serous part thereof to separate and melt into Sweat.

II. *Hydrotick Medicins*, which after a Chymical resolution of them, owe their virtue to Elementary particles, one way or other, being formed out of various subjects, and with different ways of preparation, are chiefly either spirituous, or saline, or both together united among themselves, or with some small number of sulphureous particles. For those that are meerly or for the most part sulphureous, are less serviceable to this purpose; for such being most commonly offensive to the Bowels, do oftentimes cause nauseausness, and very frequently vomiting. Moreover such as, through their great quantity of Sulphur are oily and fat, do not so easily insinuate themselves into the mass of blood. After what manner, and by what sort of operation upon the spirits and the blood, those others cause sweating, I shall enquire more particularly.

1. And first to the spirituous sort of them I refer hot Waters, and all kind of liquors that are impregnated with a Vinous spirit; such as are Chymically distilled every where out of the Fruits of Vegetables, or their Juices ripened by fermentation, or dissolved by putrefaction; such as are Spirit of Wine, Cider, Ale, Juniper berries, Elder, Black Cherries, with many other things, which are commonly called spirits; and they are taken either plain and clear by themselves, or being impregnated with the infusion of other Simples, are again distilled, or given under the form of a Tincture.

Phar. Rat.
Part I.

Sweating Medicins are like Cordials.

The matter of Hydroticks is either the integral parts of a mixt body;

Or Elementary.

1. Those of the former sort.

How they operate.

2. Hydroticks whose particles are Elementary, of what kind, and how many fold they are.

1. Spirituous ones.

Phar. Rat.
Part I.

ecture. These kind of Vinous liquors, being inwardly taken, cause sweating, not only in that they erect or raise the animal spirits, and put them into a greater expansion (whereby the motion of the heart also is quickened) but likewise for that they put the blood into a commotion and (just as when Oil is added to a flame) make it more hot and fiery. For the same reason, and upon the score of the same manner of operation that these are called Diaphoreticks, they use also to be called Cardiacks or Cordials, if they are given in a lesser dose.

2. Salt ones.

How they work.

2. For causing of Sweat there are Salt Preparations of several kinds and different qualities, which are usually prescribed, and that with good success; which nevertheless do not (as the particles of the whole mixt body, or those that are merely spirituous) either disturb the blood through their heterogeneousness [or being of another kind] or kindle it through their inflamableness [or being easily set on fire] but only by acting upon the saline particles thereof; which whilst they snatch into their embraces, they sever them from their strict union with others, so that the constitution of the blood being loosened, and the Pulse augmented, the superfluous serous parts and other dregs, do the more easily separate, and are carried off by Sweat. To this place you may refer (as I have before shewn concerning Pissing Medicins, and likewise in Cordials, as shall hereafter appear) Salt of almost every kind, but especially volatile, fluid, fixed, and nitrous Salt; out of which either severally, or in composition with each other, Diaphoreticks of the chiefest note are made: which being inwardly taken and meeting with other Salts that abound both in the bowels and in the mass of blood, and drawing them from the embraces of the other particles, do open and rarify the blood, and consequently dispose it for evacuation by sweat. We shall hereafter declare to you the chief sorts of them, with their manner of operation; but in the mean while, seeing the same salt Medicins that use to be given for sweating, are also commonly prescribed to provoke Urin, and sometimes for Cordials too, I must shew you with what preparation, and also with what requisits we ought to prosecute this manner of evacuation by sweat apart from those other intentions.

*The several
states of their
saline particles.*

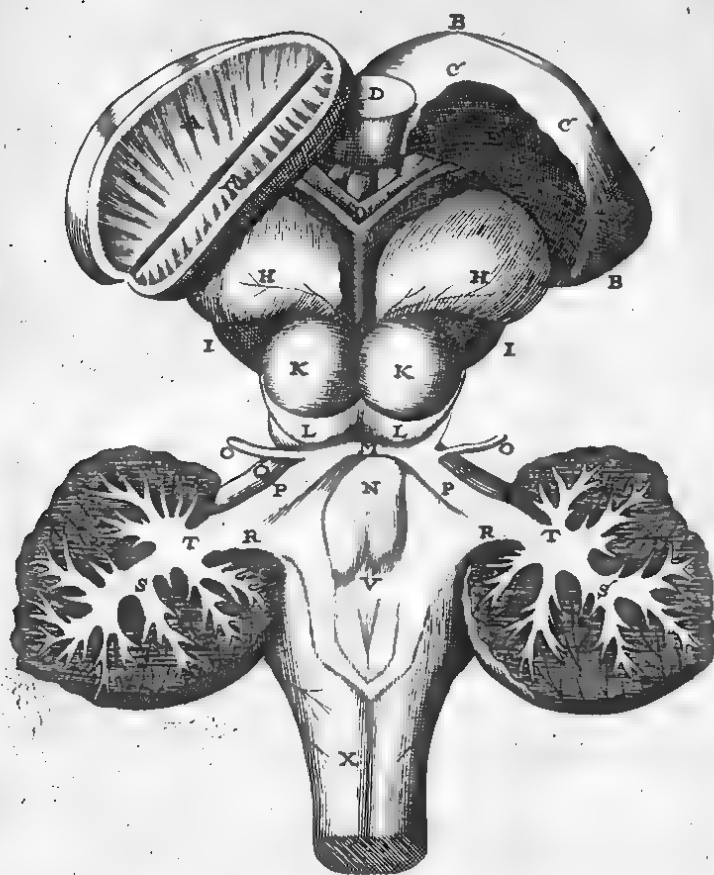
*How Sweats
ought to be ad-
ministrated.*

And indeed we observe, that sweating Medicins taken inwardly do seldom or never work of their own accord, as Vomits, and Purges, or Diureticks do; and besides that, a man must always use great caution, and keep ones self warm, to actuate the Medicin, and to determine that operation. Wherefore, from the time that the sweating Medicin is given, the Patient is to be treated in that manner, to the end that not only the Pores of his body may be opened, but also very much to quicken the pulsation of the heart. For these ends; let him be kept in a warm Bed, a Bath, or Hot-house, or exercised with a swifter or more laborious motion of his Body than usual; all which, that it may the better succeed toward the provoking of Sweat, we must chuse the most convenient time and subject, as oft as it is in our power; that is to say, when the blood being in a good temper, or at least, not a very bad one, doth both sufficiently abound with serous humours, and is not too confused or disturbed in its particles, but is inclined to open, and separate, or be dissolved into several parts. For in a cholerick temper, a thin and dry constitution, and in the midst of a burning Fever, when all things are out of order and indigested, Diaphoreticks are oftentimes given in vain, or when they are not proper. Moreover as often as they seem to be useful, you must not give any kind of them indifferently; but according to the several conditions of the blood, and the different predominancy of sometimes this and sometimes that Element therein, and the states or qualifications of the Salts, you must make choice of such and such Medicins. To this purpose we shall in the next place tell you, with what caution, and in what forms they ought to be prescribed.

*Time and Sub-
ject must be cho-
sen most conve-
nient for sweat-
ing.*

Fig. VIII.

II. p. 86



C H A P. II.

The Sorts and Receipts of Diaphoreticks [or Sweating Medicins] with the Reasons of some among them which are Chymical.

Seeing that Sudorifical or sweating Medicins are manifold and of different sorts, and use also to be variously ordered and reduced into Classes or ranks; I therefore thought fit in this place first of all to give you an account of, and distinguish the same both in their form or manner of making, and also as to the matter of which they are made. Now the most usual forms in which they are given, are 1. a Powder, 2. Chymical Liquors. 3. A Potion. 4. A Bolus. 5. A Diet. The matter of every one of these is either the integral parts of a whole mixt Body, or they are the elementary parts of some mixed Body resolved and taken in pieces by Chymistry: and those are either more simple (that is to say, either spirituous or saline (which latter are either volatile or fixed, or softer or nitrous) or the sudorifical particles, so divided and separated by Chymistry, are elementary ones compounded among themselves; to wit, spirituo-saline ones, and salino-sulphureous ones. Whilest we run over each of these sorts in order, we will adapt or fit, to every kind of matter, the more select forms of prescriptions.

*what are the
Forms of Dia-
phoretick Me-
dicins.*

1. Diaphoreticks whose foundations are the integral parts of a mixt Body, and such wherein a sharp or volatile Salt predominateth, conduce oftentimes to the provocation of sweat upon this account; to wit, that their particles being admitted into the blood (seeing they are unminglable and untamable) disturb the mass thereof, divide it very much, and separate it as it were into small parcels; in so much that at last when the constitution of the blood is very much loosened and put into a boiling heat, the ferous superfluities, the dreggy parts and corruptions of the blood are thrown out along with the particles of the Medicin, which are to be cast forth upon the score of their heterogeneoufness [or being of another kind.] Those of this sort are used to be given under the form of a Powder, Bolus, Potion, and Diet, according to the following prescriptions.

*Such as have
the integral
parts of a mixt
body for their
basis.*

Take of the dust of the roots of Contrayerva, Virginy-Creeper and Lagwort, each 3j. of Cocchineel and Saffron, each 3℥. make a Powder. The Dose is 3℥. with a convenient vehicle. *The Receipts of
them.
Powders.*

Take of the Powder of Vipers 3j. and give it in a convenient Liquor.

Take of the Powder of Toads prepared 3℥. to 3j.

When Diaphoreticks ought to predominate with an alchali Salt alone, or mingled with the former;

Take of Eastern Bezoar 3℥. to 3℔. and give it in a spoonful of distilled Water, or of any other vehicle.

Take of the Powder of Crabs Claws compound. 3j. to 3℥. and give it the same way.

Make your Powder of Bezoar in this manner following:

Take of the Powder of the Roots of Contrayerva, and of Crabs Claws, simple, each 3ij. of Pearl, both sorts of Coral, of the whitest Amber, of Crabs Eyes, Harts horn, and Chrysal prepared, each 3j. of Western Bezoar, and of Terra Lemnia, each 3℥. of Ceruss of Antimony 3ij. of Cocchineel 3℥. of Amber grise 3j. of Musk 3℥. make a small Powder, and form it, with Gelly made of Vipers skins, into little Balls. The Dose is 3j. to 3j.

Take of this Bezoar Powder 3j. of Toads prepared, gr. vj. make a Powder, and give it in a spoonful of Treacle water.

2. Bolusses, the bases or foundations of which are the integral parts of a mixt Body, reduced into the form of a Confection, Extract, or Conserve.

Take

Phar. Rat.
Part I.

Take of Mitbridade \mathfrak{z} β . to \mathfrak{z} j. of Powder of Bezoar \mathfrak{z} j. to \mathfrak{z} β . Syrup of the juice of Citron a convenient quantity; and make a Bolus. In place of the Mitbridade you may put Treacle or Diascordium, or Confectio liberans de Hyazintho. So Bezoar pulverized, or Powder of the roots of Contrayerva, or of any other things like unto it, may supply the room of the Powder of Bezoar.

Take of the Extract of Treacle \mathfrak{z} β . to \mathfrak{z} j. of the Powder of Bezoar \mathfrak{z} j. and make a Bolus.

Take of the Extract of Carduus \mathfrak{z} β . of the Powder of Bezoar \mathfrak{z} j. of Salt of Wormwood gr. xv. with a convenient quantity of Syrup made of the juice of Citron; and make a Bolus.

3. Potions.

3. Potions whose Foundations are the common Decoctions of Vegetables, or Infusions and Tinctures.

A Decoction.

Take of the Roots of Lagwort \mathfrak{z} j. of the Seed thereof \mathfrak{z} ij. of Candied Ringo root \mathfrak{z} vi. of Carduus seed \mathfrak{z} ij. and boyl them in Spring water, one pint to half a pint, in the clear straining whereof take \mathfrak{z} β . or \mathfrak{z} ij. of Mitbridade, warm in bed.

In like manner take the Leaves of Carduus, Marigold or Camomile Flowers, and boyl them in a convenient quantity of Posset drink. Of which give \mathfrak{z} vi. or viij. warm by it self, or with a Powder, a Confection, or any other Diaphoretick joined to it.

Infusions and Tinctures.

4. Several sorts of Diaphoretical Infusions and Tinctures may be prepared by extracting the Vertues of simple Vegetables, and of Confections with Wine, Vinegar, or distilled Water: which being afterward strained and clarified by settling, are oftentimes very successfully given either by themselves or in composition with other liquors. Hither we ought to refer all Waters, Wines, and Venegars of Bezoar, prepared by Infusion, the Receipts whereof are very frequently met with among Authors. Moreover the Tinctures of Vegetables, that are very efficacious in a small Dose, are made in this manner following.

Chymical Tinctures.

Take of the roots of Contrayerva lbj. and when you have bruised it and put it into a Matrace, pour to it of spirit of Wine three pints. Let them digest to extract a Tincture, which you must strain, and let it evaporate in a Bath to the consistence or thickness of Honey. Keep the spirit which you first drew off, apart from the rest, and pour it again into the remaining part of it: and then again extract a Tincture: of which the Dose is \mathfrak{z} β . to \mathfrak{z} j. in a convenient vehicle.

5. Diets.

5. Diets, the bases or foundations whereof are Decoctions of Liquors, designed for the cure of the Pox, and some other chronical Distempers, deeply rooted in the blood and humours.

For, to the curing of some Diseases very violent and frequent Sweating, that is, a long time together, and every day, is necessarily requisit: not onely to purge out the impurities and corruptions of the Bowels and Humours, but also totally to extinguish, or as it were, root out the morbidick tinctures, that are so deeply impressed upon them. To this end, it will not be enough to give a Sweating Powder or Bolus some few times, but a mans whole Diet ought to be directed to this end onely: wherefore all ones drink in such a case ought to be a Diaphoretick Decoction, after a Dose whereof taken in the morning, you must sweat plentifully either in a Bath or Hot-house. Then, when by this means both the pores of the skin are opened, and Nature also is inclined to an evacuation by Sweat, let the recrements of the blood and nervous juice evaporate all the day after by transpiration, which must be still continued by the use of the same drink. By this method not onely the Pox is most safely and for the most part most certainly cured, but likewise other Herculean Distempers are sometimes happily healed.

Take of the shavings of Lignum Sanctum, or Guaiacum \mathfrak{z} iv. of Sarsaparella \mathfrak{z} vi. of China \mathfrak{z} ij. of all kinds of Sanders, each \mathfrak{z} j. of the shavings of Ivory, and of Harts horn, each \mathfrak{z} β . of Antimony pulverized and tied up \mathfrak{z} vi. infuse them according to Art, and boyl them in xvj. pints of Spring water till half be boyled away; then strain it, and to the dregs of the Ingredients that remain, pour a like quantity of water, and make an Infusion and a Decoction till a third part be consumed, adding of Raisins lbj. of Licoris \mathfrak{z} j. and keep the straining for your ordinary drink. In

In a choleric temperament, and when the blood is sharp and hot, you must omit *Phar. Rat.* the Guaiacum, increasing the quantity of China and Sarsa.

Part I.

Diaphoreticks that consist of the integral part of a whole mixt body, and are easily got for the Poor, must be prepared according to the Receipts following.

Diaphoreticks that are easily got.

In malignant Fevers. Take of Conserve of Allulujah \mathfrak{z} j. and of Mithridate \mathfrak{z} ij. \mathfrak{ss} . mingle them, and let the Patient take them, drinking thereupon a draught of Posset drink, with Carduus or Scordium Leaves, or Camomile, or Marigold Flowers boyled in it.

Take of the roots of Virginy Creeper pulverized \mathfrak{z} \mathfrak{ss} . to \mathfrak{z} j. and give it in a convenient vehicle. Or, Take of the roots of Lagwort pulverized \mathfrak{z} j. after the same manner.

In ordinary cases give the Decoction of Grumwel, roots of Lagwort, or Virginy Creeper, or roots and seeds of Burdock. In the Pox, The Decoction of Sopewort or Sharwings of Box wood, and the like, may supply the place of the Decoction which is made of Woods that are of greater value.

2. Sweating Medicins prepared out of the elementary parts of a mixt Body, have for their foundation either a Spirit or a Salt, sometimes simple, and sometimes joined with another Salt or with Sulphur. Spirituous Medicins must be prescribed according to the Receipts following.

Forms of Chymical Diaphoreticks.

1. Spirit of Treacle camphorated \mathfrak{z} \mathfrak{ss} . to \mathfrak{z} j. or \mathfrak{z} j. \mathfrak{ss} . may be given in a convenient vehicle.

Such as have spirituous particles for their foundation.

After the same manner also many other Spirits, distilled out of the juices of Vegetables that are ripened by fermentation, and appropriated to some certain Distempers, may be given to provoke Sweat at any time when it is proper: such as are the spirit of black Cherries, of Elder, Ivy, and Juniper, berries, with many others. Spirit of Harts horn, Soot, Blood, and the like, ought rather to be reckoned among the saline Medicins.

2. Diaphoreticks whose foundations are Spirits, with other elementary particles mixed among them, must be prescribed in this manner;

Such as have spirituous particles united with others.

Take of the simple mixture \mathfrak{z} j. and give it in a convenient vehicle.

Hither also you may refer such as consist of a Spirit, fixed Salt, and Sulphur united: such as are the Tincture of Salt of Tartar and Antimony, of which the Dose is \mathfrak{z} j. to \mathfrak{z} ij. in another liquor. Moreover Distilled Waters, in which the spirituous particles are diluted with watery ones, are oftentimes used to be given to provoke sweat with very good success.

Take of the Roots of Lagwort, and Valerian, each \mathfrak{z} ij. of Zedoary, Contrayerva, or Drakes Root, and Virginy Creeper, each \mathfrak{z} j. \mathfrak{ss} . of the Flowers of Lagwort or Butterbur \mathfrak{iv} . \mathfrak{ss} . handfuls, of Saffron \mathfrak{z} ij. to which when shreded and bruised pour \mathfrak{iv} . pints of Sherry Wine; distil them according to Art, and mingle all the liquor. The Dose is \mathfrak{z} ij. \mathfrak{ss} . to \mathfrak{z} ij. Or, Take of the roots of Angelica, and Masterwort, each \mathfrak{z} \mathfrak{ss} . of Zedoary, Elicampagne, Swallow wort, Gentian, and the lesser Galingal, each \mathfrak{z} j. of the tops of Carduus, Rue, and Angelica, each \mathfrak{ij} . handfuls, of the middle Bark of an Ash tree \mathfrak{z} vj. when you have shreded and bruised them, put to them of Mithridate, and Treacle of Andromachus, each \mathfrak{z} ij. mingle them, and pour to it of generous Wine \mathfrak{vj} . pints, of distilled Vinegar \mathfrak{ij} . pints, distil them according to Art. The Dose is \mathfrak{z} ij.

Distilled Waters.

The Doses of the aforesaid Waters may be actuated by the addition of Chymical liquors or salts. Such Medicins as these that are impregnated with a vinous spirit are proper chiefly and almost onely for old men; and likewise for such as are of a cold temper, and those that are subject to a Palsie or Dropsie; but in an hot constitution, and when the Bowels burn, or the Blood is in a feverish commotion, they usually do more hurt than good, in as much as they inflame the former, and put the latter into an excessive effervescence.

Phar. Rat.
Part I.3. Those whose
basis is Salt.

Diaphoreticks whose basis is saline, as they are of several sorts, to wit, (according as the salt is volatile, fixed, sower, or nitrous, so they are) of a different use and operation; which is the reason that in some cases one sort, and in other cases another sort is more proper; as I observed before concerning Diureticks, or Pissing Medicins.

1. Such as consist
of fixed or
volatile Salt.

1. Fixed and volatile Salt are most proper for those, whose Blood abounds very much with a serous humour. So also, when the juice that moistens the bowels and the nerves, grows sharp, (as it is usual in those that have the Dropsie, or an ill habit of body, and such as are liable to convulsions) those kind of Medicins are more successfully used to provoke sweating; but, when they meet with the acid-saline particles of the humours, and are united thereunto, they loosen the constitution of the Blood, and likewise through the heterogeneousness (or different ingredients) of the mixture, disturb the mass thereof, and therefore to the end that the serous parts of it may be the more easily separated, and driven outward through the pores of the skin, those Medicins are prescribed in the form of a Powder, a Bolus, and a Liquor.

Their Forms or
Receipts.
Powders.

Take of the Flower of Sal Armoniack $\mathfrak{D}\beta$. of Chrystal Mineral gr. xv. of Bezoar Powder $\mathfrak{D}\mathfrak{j}$. mingle them, and give it in a spoonful of Aqua Sudorifica or Sweating water.

Take of Salt of Tartar $\mathfrak{D}\mathfrak{j}$. of Ceruss of Antimony gr. xxv. and make a Powder, to be given the same way.

Take of Bezoar Powder Mineral $\mathfrak{D}\mathfrak{j}$. to 3β . of Gascoign Powder $\mathfrak{D}\mathfrak{j}$. make a Powder, and give it in the same manner.

Take of Ceruss of Antimony $\mathfrak{D}\mathfrak{j}$. to 3β . of the Flower of Sal Armoniack $\mathfrak{D}\beta$. and make a Powder.

2. These Medicins may be given in the form of a Bolus, by mingling the aforesaid Doses with Treacle, Mithridate, or Dialcordium, or with the Extract of Carduus, Gentian, or the like.

Boluses.

Take of Bezoar Powder Mineral $\mathfrak{D}\mathfrak{j}$. of Flower of Sal Armoniack gr. vj. and of Mithridate 3β . make a Bolus.

Take of Salt of Hartshorn gr. viij. of Bezoar Powder gr. xv. of Extract of Treacle $\mathfrak{D}\mathfrak{j}$. make a Bolus or iij. Pills.

3. If it be more convenient to take them in the form of a Liquor.

Liquors.

Take of Spirit of Hartshorn or Soot, or Sal Armoniack from xv. to xx. drops, of Aqua Sudorifica [or Sweating water] $3\mathfrak{j}$. to $3\mathfrak{ij}$. make a potion, and let the Patient take it with caution, keeping within doors.

Take of the Flower of Sal Armoniack $\mathfrak{D}\beta$. of Salt of Tartar gr. xv. of Aqua Sudorifica $3\mathfrak{ij}$. mingle them and make a draught.

Such whose basis
is nitrous
Salt.

4. Diaphoreticks that have a nitrous Salt for their basis or foundation, are used with success in almost the same cases, as the former, which are composed of fixed and volatile Salt; in as much as they destroy the predominancy of the acid Salt, and so dispose the mixture of the Blood, that whilst it boyls up, the Serum and dregs thereof may be the more easily separated and carried off.

Take of Chrystal Mineral $3\mathfrak{ij}$. of Salt of Hartshorn, or Soot, or Vipers $3\mathfrak{j}$. mingle them. The Dose is from $\mathfrak{D}\mathfrak{j}$. to 3β . in a convenient vehicle.

Take of Sal Prunellæ $3\mathfrak{ij}$. of Bezoar Mineral Powder or of Ceruss of Antimony $3\mathfrak{j}$. make a Powder. The Dose is $\mathfrak{D}\mathfrak{ij}$. to $3\mathfrak{j}$.

Those whose basis
is an acid
Salt.

5. Diaphoreticks whose basis is an acid Salt, are of greatest efficacy against the predominancy of fixed Salt and Sulphur; that is to say, When the mass of blood is too thick and tenacious by reason of the saline-fixed particles which are united with the sulphu-

fulphureous and earthy ones, so that it will not easily allow the serous parts of it to be carried off by Sweat (as it usually happens in continued Fevers and the Scurvy) an acid Salt, in the Medicin which is given, meeting with a fixed Salt in the body, and forcing it into its embraces, destroys the hurtful unions thereof; and consequently loosens the boyling bloud, and disposeth it for sweating. Phar. Rat.
Part I.

Take of Spirit of Tartar from 3℔. to 3j. of Aqua Sudorifica 3 iij. of the Flower of Sal Armoniack 3℔. mingle them. Potions.

Take of the Simple Mixture 3℔. to 3ij. and give it in a spoonful of Treacle or Bezoar water.

Take of Bezoar Vinegar from 3℔. to 3j. of Carduus water 3 ij. of Plague water 3vj. mingle them and make a draught.

Take of Spirit of Guaiacum 3j. of Aqua Sudorifica 3 iij. mingle them and make a Potion.

§. Some things that are meerly or for the most part sulphureous are commonly reckoned among Sweating Medicins; as some natural Balsams; and others that are made, as also Chymical Oils, and especially those of Guaiacum, Box, Camphire, Hartshorn and Soot; so likewise the resinous Extracts of ponderous Woods, with many other things, which though by themselves they are of little efficacy toward provoking of Sweat, yet when they are joined with other saline ingredients, I am of opinion that they are not altogether useless; in as much as in a cold and phlegmatick constitution, sulphureo-saline things rarifie the bloud when it is too waterish, and dispose it to a freer evaporation, as much as spirituous things do. Sulphureous
Diaphoreticks.

Take of Balm of Gilead from vi. to xij. drops, of water of Baum, or of Ground Ivy 3 iij. of Aqua Sudorifica 3℔. and let the Patient take it every morning for several days together, to sweat. It is proper for those that are Pthysical, or have Ulcers in their Reins.

Upon the same account, but in a larger Dose, you may give Balsam of Peru, and likewise Tincture of Balsam of Tolu, as also stillatitious Balsams compounded.

Take of Rosin of Guaiacum pulverized 3 ij. of chymical Oil of the same 3j. of Bezoar Mineral and of Gum of Guaiacum each 3j. of Balsam of Peru, a convenient quantity: make a mass for Pills. The Dose is from 3℔. to 3ij. drinking thereupon a Dose of Aqua Sudorifica, or Decoction of the Woods. Pills.

The Chymical preparations of some Diaphoreticks, with the reasons why they are so made.

Bezoar Mineral.

Take of Butter of Antimony rectified 3 iij. pour to it drop by drop of the Spirit of Nitre, or The Aqua Stygia an equal quantity; draw it off in the heat of Sand, and pour it thereunto again, adding of the same menstruum fresh 3j. and draw it off again, repeating it three or four times. When you have taken the matter out and pulverized it, calcine it for an hour in a crucible; then sweeten it by washing, and burning Spirit of Wine upon it for three or four times. The Dose is from 3j. to 3j. Preparation of Bezoar-mineral.

In the preparation hereof it is worth our observation, that whilest these exceeding sharp liquors are put together, immediately the Salts meeting with each other, are strictly united; in the mean time the sulphureous particles which abound in it, being totally excluded and freed, fly away, and taking some saline particles along with them, cause a very offensive heat and smoak, as if something were actually a burning: then when these are driven away, the saline ones that are left behind, are more closely united with some earthy ones of the Antimony, and at last having undergone the fire, that the Emetick or vomiting Sulphur may totally exhale, and the corrosive sharpness of the Salts be rebated, they make an excellent Diaphoretick; in as much as the different Salts in this Medicin, meet with the Salts in our Bodies, to which whilest they are united, the union of the bloud and humours is dissolved, so that the way whereby for The reason of it.

Phar. Rat.
Part I.

the ferous recrement to pass out is wide enough; in the very same manner, as when Spirit of Nitre poured upon Butter of Antimony, or *Aqua Fortis* upon the filings of Iron, causeth a great ebullition or bubbling with heat and black fume; the reason of which is, because the sulphureous particles (whilest the Salts unite) fly away in great quantity as from a kindled fire. And that actual flame is not caused in this case, the reason is, because a great many salt particles arise with the sulphureous ones, by which the sulphureous ones are every where separated from each other, lest coming together they might take fire and flame.

Bezoar Mineral is said to be made after a more compendious way, in this manner:

You must precipitate Butter of Antimony infused in Spring water, into a white Powder, called *Mercurius Vitæ*: which being dried, you must put by little and little into Salt of Nitre, melted in a crucible, and let them flow together for a quarter of an hour. After that, when the Nitre is dissolved by frequent pouring Spring water upon it, a white and fixed chalk will remain: Which neuertheless, though it be used for a Diaphoretick, differs very much from the Bezoar Mineral, because in it the Salts of the menstruums, upon which the virtue of the Medicin very much depends, are almost quite washed away: Besides that, comes nearer to the nature of Ceruss of Antimony, or rather seems to be the same thing with it.

2. Diaphoretick Antimony.

Antimony Diaphoretick.

Calcine your Antimony twice or thrice, with an equal quantity of Nitre, then melting it in a crucible, either let it run for some time, or throwing in a coal, let it make a noise till such time as the Sulphur being quite spent, a calx remains, consisting in a manner onely of Salt and Earth, and impregnated with fiery particles: which, when it is sweetened (as the way is) with frequent washing, becomes a milder *Caput mortuum*, or insipid Earth.

The reason of it.

And although it be stiled by the name of a Diaphoretick, yet I know not to which of its particles that virtue can be attributed; and I have often in vain expected such an effect from this Medicin. It is indeed often used with good success to stop fluxes of the Serum or the Bloud; because this Earth being bereft of its proper Salts, inhibes other strange sorts of acid Salts, which it by chance meets with in our bodies; the like operation to which *Crocus Martis* seems to have (being prepared by a reverberating fire) and from the like cause, as I have elsewhere hinted to you.

Ceruss of Antimony.

Ceruss of Antimony, prepared out of the purer part thereof, that is to say, *Regulus* calcined with Nitre, is onely the purer or more clarified calx of it. In the preparation whereof you add Tartar, because the *Regulus* hath but very little Sulphur (without which Nitre will not burn) in it; wherefore, for the better performance of the calcination, it is necessary to make an addition of Tartar, which abounds with sulphureous particles.

3. Flower of Sal Armoniack.

Flower of Sal Armoniack.

Take of Sal Armoniack pulverized lb. j. of filings of Iron $\frac{3}{4}$ xii. which having pounded and mingled, distil them in a Retort with a large neck, increasing the fire of the Reverberator by degrees: an yellowish liquor, which is the Spirit of Salt, will drop out into the Receiver, and the Flower will be sublimed partly into the sides thereof, and partly into the neck of the Retort, which being gathered together, may be kept in a Glass for your use. The Dose is from gr. v. to xv.

The variation of this method.

This operation is performed by mingling Sal Armoniack with washed Colcothar, as also with the Calx or Salt of Tartar. The reason of which mixture is this; first, to keep the Sal Armoniack from fusion or running. Secondly, That when the Particles of the more fixed Salt adhere or stick to the Iron, Colcothar, or Calx of Tartar, the volatile parts of them being free from restraint, may easily ascend. And thirdly that the Flower, whilest it ascends, may carry along with it something of another body, to wit, of Mars, Venus, or Salt of Tartar, and be impregnated with the virtue of it. When the sublimation is performed with Iron or Calx of Tartar, there are Tinctures drawn out of each *Caput mortuum*, (with Spirit of Wine) which are of no small use.

4. Spirit of Sal Armoniack.

Take of Tartar calcined with Nitre, and of Sal Armoniack, each ℥ iij. and when you have pulverized them severally, mingle them and put them into a large Cucurbit, pouring to them of Spring water vi. or viij. Pints, and distil them in an Oven of Sand. The Spirit will arise with the gentlest heat, pure, and very penetrating, without any burning: which if you rectifie it in a deep Cucurbit, a most pure volatile Salt will ascend into the Alembick.

The reason of this procedure is this: The Sal Armoniack consists of a volatile salt made out of Soot, Piss, and Sea-Salt; all which uniting, whilst they are sublimated, the saline-volatile particles being totally freed from the sulphureous ones, that used to stick to them, are so fixed and settled by the Sea-salt ones, that they cannot fly away. But as soon as ever this Bond is dissolved; that is to say, when this compound Salt, being dissolved in water, is intimately mixed with the salt of Tartar, the particles of Sea-salt stick close to the saline-fixed ones of the Tartar; and consequently the volatile ones being dismissed from their embraces, and ready to fly away, do very easily arise; but whereas the spirit distilled from Sal Armoniack hath no offensive smell, as liquors drawn from Soot or Urin have, the reason is, because in that composition the volatile Salt, by the intervening of the Sea-salt, is altogether deprived of any sulphureous particles; which, when Soot or Piss are distilled by themselves, stick fast to the volatile Salt (as appears very plainly from the ill odour of them both) and likewise because the liquors distilled from those bodies, being first clear and limpid, grow afterward of an yellow colour, and become at last red, and black, and opacous or dark; to wit, in as much as the sulphureous particles being first subdued and hid by the saline ones, get by degrees their liberty, shew themselves and predominate over all the rest.

But in that composition of Sal Armoniack, that the particles of Sea-salt, of Piss and of Soot drive away the sulphureous part and fix the volatile Salt, is very manifest even from this Experiment also, which the famous Zwelferus found out for the fixing of volatile Salt. For Example:

Take of the volatile Salt of Vipers, Piss, or Harts horn, as much as you think good; which when you have put into a Cucurbit with a streight, and saving one little hole, a close orifice, pour into it drop by drop the spirit of Sea-salt to the height of two or three fingers, till all the Salt be dissolved: then filtrate the dissolution, and draw it off in a cucurbit, till it be dry. There will remain in the bottom a Salt of a good smell, somewhat acid, and of a salt taste; the use whereof is very much cried up in several Distempers.

In this case I have tried and found yet farther, that if you would recover your volatile Salt, you must put Salt of Tartar to it, and sublimate it in a Glas; from whence there will arise a most pure volatile Salt. In this manner you may so rectifie Spirit of Soot, of Harts horn and Bloud, that when their sulphur is quite driven away, they may become more grateful and less corruptible Remedies.

The Spirit of Sal Armoniack may also be distilled many other ways, to wit, if you mingle the dissolution of that Salt with a Lie of fixed Salt, or of slacked Lime in an equal proportion; for by this and perhaps some other means, whilst the particles of Sea-salt contract new confederacies, the former associates fly away. So it is also in the distilling of Piss, as is shewn in its proper place.

5. Spirit of Soot, Harts horn, &c.

Take of heavy Soot that comes from burnt wood, and shines with a blackness like Pitch, a convenient quantity, so as to fill an earthen Retort above half full; then having fitted thereunto a large Receiver, begin the distillation with a reverberating fire, increased by degrees to a moderate heat; there will in a short time arise a spirit in a white fume, and then an yellow Oil with a volatile Salt, and lastly a blackish Oil. Gather the Salt by it self and rectifie the rest of the liquor when it is separated from the black Oil by filtration, distilling it in a Balneum Mariæ, or bath of sand, twice or thrice: so also when you have rectified the volatile Salt in a deep cucurbit, and purified it, keep it for your use. The Dose is of the Spirit from xij. to xx. drops, and of the Salt from vi. to xij. or xv. gr.

Phar. Rat.
Part I.

Small pieces or shavings of Harts horn may be distilled either the same way, with mere fire, or in a glass Retort and an Oven of Sand. So also out of a Skull, Bones, and Bloud, you may draw a Spirit, with a volatile Salt and a stinking Oil.

6. Spirits and Rosinous Extracts of Guaiacum, Box, and other ponderous Woods.

6. Spirits of
Guaiacum, Box,
and the like.

That these kinds of Woods are duly numbred among such things as provoke Sweat, is plain from this, that sudorifical decoctions are made chiefly of them. The Hydro-tick [or sweat-causing] virtue of them seems to consist in not onely a saline, but a sulphureous principle; for these Bodies are abundantly filled with such kind of particles. Wherefore besides the common manner of preparing them, by infusion and boyling, their active principles of Salt and Sulphur are severally drawn forth by a chymical resolution, and being reduced into peculiar concretions, that is to say, either a Spirit, an Oil, or a Rosin, make very fine, pleasant, and efficacious Diaphoreticks, or Sweating Medicins.

1. The Spirit and Oil are prepared in this manner.

Take of the sawed dust of Guaiacum wood lb ij. and distil it with a reverberating fire, or in an Oven of Sand with a strong heat, there will come forth a sharp, and somewhat acid liquor, and an oil that is yellow and black: separate the latter and rectifie the rest in a cucurbit, you will have a spirit that will be clear and sharp to the smell, as also an yellow and ponderous oil, which will settle in the bottom of the watery Liquor. The Dose of the Spirit is from 3 ℥. to 3 j. ℥. and of the Oil from vj. to xv. drops in a convenient vehicle.

The reason of it.

Both Medicins are Diaphoretical, and are used with success in a Dropisie, the Scurvey, and the Pox. Without doubt the saline part of this Body, which is partly fluid, and partly volatile, together with the phlegm, makes up the Spirit so called; and the more pure sulphureous part, the yellow Oil, which besides that, through the quantity of salt that sticks to it, is heavy and sinks: Yea some sulphureous particles stick fast to the acid sharp spirit or distilled liquor, in so much that it always stinks, and soon losing its clearness, degenerates to an yellow or a red colour. The black Oil consists of a salt and sulphur that is thick, that is to say, mingled with a quantity of earth. In Guaiacum the saline Element is, most part of it, elevated beyond fixedness, into a state of fluidity and volatileness; which is the reason that a Lie made of the ashes thereof, affordeth less Salt. It is quite otherwise in Tartar, whereof onely some of the saline parts are in a fluour, and a state of volatility, but most of them remain fixed.

7. Rosin of Guaiacum.

7. Rosin of
Guaiacum.

Rosin of Guaiacum is prepared after the same manner as Rosin of Scammony or Jalap, that is to say, the Tincture is extracted with spirit of Wine, and then it is drawn off to the one half; and by pouring water into the cucurbit, the Rosin will descend in great quantity, which being dried and pulverized, may be given from ʒ j. to 3 ℥. with other Sudorificks in a solid Form.

The reason of it.

That this Rosin is the sulphureous part of the Guaiacum is manifest from this; that after the extraction of it, if you distil the remaining Magma [or dreggy part that is left] in a Retort with the heat of Sand, or Fire onely, you will have a phlegm and an acid liquor in the usual proportion. Wherefore from this chymical resolution [or taking to pieces] of this Wood, we may conclude that the chymical Elements (in the same number, and just so qualified, as I have elsewhere asserted) are in mixed Bodies, and that they are not onely seemingly produced by the operation it self, as some men say.

8. Spirit of Tartar.

8. Spirit of
Tartar.

Take of choice white Tartar that shines, washed and dried (or rather as Zwelfer prescribes dissolved, and once chrySTALLIZED) lb iv. distil it in a Retort with a large Receiver, increasing the fire gradually, till the fumes are quite gone. You will have a phlegm, a spirit, an yellow and a black Oil; which last you must separate; then put the remaining liquor into a glassen cucurbit, and rectifie it twice or thrice with the heat of Sand, abstracting every time onely a third part. The Dose is, of the Spirit, from 3 ℥. to 3 j. and

and of the Oil $\text{D}\beta$ to $\text{D}\gamma$. which in a prepared Body provokes Sweat very power-
fully. Phar. Rat.
Part I.

The Genesis [or generation] and Analysis [or resolution] of Tartar cannot in this place be with convenience fully discovered to you, because they deserve much consideration; but that I may briefly touch upon the Anatomy of it, this body consists of a great deal of Salt (the most part of whose particles are in a state of fixedness, and some in a state of fluidity and volatileness) much sulphur, a little spirit, with an indifferent quantity of phlegm and earth. In the distillation the volatile salt ascending with the spirit, makes the liquor somewhat sharp and poignant; which is also, by reason of the great quantity of fluid salt and sulphur, in some small measure acid and stinks so abominably, that it scarce gains a good smell by any rectification. As to the contents of this Stagma or distilled liquor, it doth not much differ from the product of Guaiacum; unless in this, that the spirit is less acid, and doth not so readily dissolve Corals, and shelly substances: but there is a vast difference between the *caput mortuum* of this and that, for as much as out of the ashes of Guaiacum you can draw, with a Lie, but very little fixed salt, and out of the Calx of Tartar a great deal. The reason of which is manifest from what I have already said. The reason of
the Preparation.

CHAP. III.

Of excessive or depraved Sweating, and the Cure for it.

Seeing our life is in a continual flux, therefore as we ought perpetually to make new additions to our bodies, so we must take away and carry off the old and effete matter. Wherefore, for the constant removing of all superfluous or incongruous particles, there are many ways of evacuating and purging; in the performing whereof, notwithstanding Nature oftentimes knows no measure, and either makes a stop on this side, or goes beyond what is most convenient. How those evacuations (that lead from the circumference or outward circuit of the body inwards, and carry things off by a kind of particular Sink or common Shore) are to be moderated, or corrected as often as they offend either in excess or defect, I have shewn you before. The Rule of Method now requires, that I give you also directions how to cure Sweating (which is an evacuation very general and diffusive, tending from the centre toward the circumference) when it is excessive or depraved.

And indeed that such a Distemper as this doth oftentimes happen, is very obvious to common observation. For nothing is more usual, than for some People that are sick of a Consumption or Scurvy, and others that recover at last with much ado, out of lingering Fevers; nay, some that have no other distemper, nor any evident cause for it, to be always subject to daily, and oftentimes very excessive Sweats. Therefore, concerning excessive Sweating, let us first enquire how many ways, and from what causes such an evacuation may arise; and then shew what remedies, and what methods of Administration are most proper in such cases.

Excessive sweating is a Distemper too frequent.

As to the first of these, frequent and immoderate Sweating is sometimes the symptom of some other present disease; for in a Consumption and the Scurvey (as I have already told you) this is familiar: the reason of which is, because when the Blood, being either defiled with some impure and infectious matter, or in an ill temper, cannot rightly concoct and assimilate the nutritive juice that is perpetually poured into the mass thereof, it separates the same, which is still degenerated, and often gathered to a fulness with other recrements thereof, and throws it forth by Sweat.

Sometimes it is the symptom of another disease.

The cure of this Sweating depends altogether upon the removal of that distemper whereof it is the symptom; and in the mean time concerning that, as to what belongs to the regulation of our diet, we may take a very useful and necessary observation from this symptom; that is to say, that when nocturnal and excessive Sweats attend that sort of Distempers, you must use a Diet of very thin Food, to wit, Milk, Water-gruel, Barly-Broth and the like (whose gentle and soft particles the mass of blood may bear) and not by any means of Flesh or stronger meats.

2. Excessive Sweating is sometimes the effect of another Distemper that is gone and past, as when it succeeds lingering Fevers: for it very frequently happens, that 2. It is also sometimes the effect of another burning disease.

par. Rat.
Part I.

burning Fevers end in sweating evacuations (as when an hot Summer ends in a rainy Autumn) so that scarce any one recovers from that tedious distemper without this indisposition left behind it; which yet in some People is moderate and easily to be cured, but in others more grievous and no less troublesome than that disease, of which it was the off-spring. I knew a young man, who after having been sick of a Quartan Ague for ten Moneths, when he grew well again, and began to miss his Fits; melted each day into such excessive sweats, that he was faine to change his shirt and the sheets which were wet quite through (as if they had been dipped in Water) three times every night. By reason of this evacuation, which continued so for several weeks, his flesh was so consumed, and his strength so exhausted, that he was reduced to the thinness of a Skeleton. This person, when he had used several remedies without any great benefit, at last by drinking of Asses Milk night and morning, and using for the rest a Diet of Cows Milk, in a short time recovered.

The reason of it.

In such cases as these the blood perpetually rejecting its contents [or that which is in it] and as it were vomiting it out by the mouths of the Arteries, doth not onely immediately cast forth the chyle that is poured into it out of the Bowels, but likewise sucking back both the nervous juice, and the substance or parenchyma of the Solid parts for its own nourishment, it presently nauseates all that, as well as the nutritive liquor, and expells them through the pores of the skin.

The cause of excessive Sweating.

Partly from the ill temper of the blood.

The chiefest cause of this Distemper seems to consist in an ill temper and weakness of the blood; in as much as the liquor of it, like sower Milk, is continually apt to dissolve and be precipitated into a serous nature; which is the reason that not onely its own corruptions, but also all other humours that flow into it from other parts, if they cannot be assimilated, are presently separated, and seeing the pores of the skin are very wide, are carried off by sweating, rather than any other way of evacuation. But whereas the blood is disposed for fluidity or dissolution so much, the reason is many times, from the predominancy of the fluid or acid Salt (as in sower Milk) in the mass of it. But sometimes the nervous juice degenerating into a sharpness, is rather and more in the fault; for thereby the acid dreggy parts of it, being remanded or sent back into the blood, dissolve the mass of it and precipitate it into a serous humour: and from such a cause I suppose the *Diabetes* and English sweating (as they called it, because it was peculiar to this Nation) had their originals.

Partly from want of heat in it.

Such excessive sweating as this, doth not proceed onely from the vitiation of the temper and fermentation of the blood, but sometimes uses to arise from a depraved heat therein. How the blood, which boyls up in a Fever through excess of Sulphur, breaks out now and then into sweats, I have shewn you before: but this symptome sometimes happeneth as much through the defect of Sulphur. For if at any time the Blood being impoverished and made more watery, is less heated, for that reason, whenever it is forced into a more rapid motion than ordinary, through external heat or agitation of the body, the serous parts of it must of necessity (if they cannot be consumed with heat, or exhale insensibly) be dissolved into sweat. Sulphur is lacking in the blood, either because it is consumed, as after lingering Fevers, or because through scarcity of nutriment, there is not a sufficient quantity generated. This latter cause you may observe not onely in many men (who either having wanted provisions, or having used a Lenten Diet, after hard running or walking, fall presently into a sweat) but also very signally in some Beasts, which when they are fed with fresh Grass or Hay, sweat very much, and quickly tire upon any labour.

The Cure of it; which is performed by doing three things.

As to the cure of excessive sweating, which arises from the aforesaid causes and occasions, the means to remedy it will be chiefly these three; to wit, First to remove or amend the ill temperature or weakness of the humours. Secondly, A little to constrain or close the pores of the skin which are too wide. And thirdly, To draw the Serum and watery recrements of the blood toward the Reins.

1. The first Indication. To take away the ill temper of the humours.

1. The first is performed by such remedies as destroy the predominancy of the acid Salt in the blood or nervous juice; and also such as promote the exaltation of the Sulphur if perchance it be deficient. To which ends antiscorbutical, chalybeate, and all Medicins that are prepared with volatile, nitrous, and alchalyzed Salt, are oftentimes useful; of each whereof I will here add some Receipts.

Take of Conserve of the Flowers of Succory and Fumitory, each ʒij. of Powder of Ivory, of Harts horn, and of prepared Coral, each ʒj. of Pearls ʒij. of Species Diarrhod. Ab-batis ʒj. of Lignum Aloes, yellow and red Sanders, each ʒij. of Sal Prunelle ʒij. with a sufficient quantity of Syrup of Fumitory: Make a Confection, and let the Patient take

take the quantity of a Walnut at Evening and in the Morning early, drinking there-
upon either of the following Julap or of distilled water ℥ij . Phar. Rat.
Part I.

Take of the Water of Fumitory and plain Wallnuts, each ℥vj . of Snails and of Worms,
each ℥j . of Sugar ℥vj . mingle them and make a Julap. A Julap.

Take of the Tops of Beech, Tamarisk, and Cypress, each iv . handfulls, of Myrtle ij . hand-
fulls, of the Leaves of Watercresses, Brooklime, of Maudlin, of St. Johns wort, Harts
Tongue, and Pauls Betony, each ij . handfulls, with the outward rinds of 12. Oranges,
which when you have cut in pieces and bruised, pour to them of Mum viij . pints, distil-
ling it in the common Vessels, and mingle the whole liquor, and sweeten it at your plea-
sure. The Dose is ℥ij . twice a day. A distilled wa-
ter.

Take of the leaves of Piſſabed; Water Cresses, Plantain, and Brooklime; each ij . handfulls, An. Expression
bruise them, and pour to them of the distilled Water just now prescribed one pint, strain
them hard. The Dose is from ℥ij . to iv . in the morning at 9 of the Clock, and at 5 in
the afternoon. or squeezing out
of a liquor.

According to this method in a languidness of the strength, and nocturnal sweats af-
ter long Fevers do I use to prescribe; and if these remedies have not a good effect, then
I am fain to proceed to Chalybeate or Steel Medicins. Chalybeate or
Steel Medicins.

Take of Syrup of Steel ℥vj . and let the Patient take one spoonful in the morning and at 5 of
the Clock in the afternoon with ℥ij . of the Water before prescribed. A Syrup.

Take of the Powder of Ivory, and of prepared Coral, each ℥ij . of Crocus of Iron, and of Sals
of Steel, each ℥j . make a Powder. The Dose is ℥℥ . twice a day, with ℥ij . of the same
distilled Water. A Powder.

Take of the Tincture of Salt of Tartar ℥j . The Dose is from 20 to 30 drops twice a day
with the distilled Water. Tinctures.

After the same manner you may give Tinctures drawn out of Coral, and likewise
out of Gums and Balsams. Moreover in these cases Spirit of Harts horn, of Piſs or
Soor are oftentimes given with success.

The second intention for the curing of excessive sweats, consists in a due constitu-
tion of the pores, and is performed for the most part by exteriour administrations; to
which end you must use to anoint the whole body with Oil of Almonds, Palm Oil,
Ointment made of Orange Flowers and the like; and wear linnen that is moistned
with these things. Sometimes Bathing in cold Water, or in a River, and sometimes
change of Air is good. Concerning the use of all which (since they are vulgarly
known) I shall not need in this place to prescribe a particular Rule. The second In-
tention consists
in the altera-
tion of the pores

But here it seems necessary to say something concerning a certain troublesome Di-
stemper, tending toward excessive Sweating, or at least immoderate Transpiration. Of that Distem-
per, which is
commonly called
An aptness to
catch cold.
I have often observed that some men have had the pores (or instruments of Tran-
spiration) in their bodies so disposed, that they were injured by nothing more, than by
the unusual approach of the Air; in so much that though they were well looked, lusty
men, had a good appetite, slept well, were strong in their limbs, and seemed every
way healthful, yet they could not endure even the least breath of the open air or wind,
but they presently felt the greatest disturbance in their spirits, a faintness in all their
faculties, and an indisposition in their whole bodies; which kind of disorder, though it
be so slightly contracted, they do not either quickly or easily shake off, but recover
themselves to their former state onely by length of time; and such as are inclined to
this Distemper fear the air more than others do fire or water. Hence some of them
dare not venture to go out of doors, whilst others living in a close Chamber, will
not suffer either the door or window to be opened, and if perchance a small blast get
in through any by-hole, they presently are very sensible of it, and suffer for it. I have
known some that upon such an occasion have been kept in their Beds for several
Moneths. I remember a Schoolmaster who was an healthy strong man, that for
above ten years never went out of his Chamber, nor could be brought to it by any
temptation or persuasions: and when after that, the house falling on fire, he was drag-
ged out by force, he was dangerously ill from that time for several Moneths, without
any other hurt, or ailment. Others are afraid to walk or stand upon a Court or Pave-
ment

Phar Rat

Part. I.

The reason is
inquired into.How the Bloud
and Spirits are
affected by the
ambient Air.The aforesaid
Symptoms pro-
ceed from their
being affected.

ment laid with Stone, Earth, or Bricks, as being used to get great injury thereby. Many other such like cases as these happen, which are attended with this infelicity also, that few pity such as are so indisposed, and do not think them to be really sick save onely in their fanisie.

That therefore we may a little inquire into the nature of this Distemper; I do not think that these people complain of nothing at all, but without doubt they do feel a kind of pain or indisposition, which is inflicted upon them either by the cold which they take, or the alteration of their way of transpiring: but to know certainly what it is, and wherein the reason of it consists, we must first of all consider, after what ordinary manner the particles of the ambient [or encompassing] air work upon the pores of our bodies, and affect their subjects, to wit, the animal Spirits, which are diffused about the surface of our bodies. For it is manifest that the animal Spirits, as being of an ethereal nature or constitution, are very much refreshed by the congenerous particles of air or light (so they come proportionably to them) and are moved to a pleasant kind of expansion [or breadthening of themselves.] So likewise the bloud, whilst in its circuit it passes through the outward borders of the body, doth there as it doth in the parts about the heart, not onely exhale its fuliginous parts through the mouths of the arteries, but also receives a nitrous matter to keep in the flame thereof, through the cavities of the veins. In order to these benefits of the bloud and animal spirits, the pores of the skin ought to be rightly fashioned, and opened in such manner, as that the particles of air and light, being a little rarified, may strike against the outmost surface of both those substances in a moderate quantity and with a gentle fall. For otherwise, if the approach of the agent to the one or other of those patients, or to both of them together, be disproportionate, immediately disturbances arise in this or that, or in both parts of the soul together. For if the spirits that are outward, are either weak, infirm, and soon scattered in themselves, or exposed to the open and sharp air, by reason that the pores are too wide, it often happens that they are put into flights and distractions upon every slight occasion; in so much that the party hath pains, convulsions, or weakness, not onely in several places about the outward parts of his body; but oftentimes taking cold (as they call it) is attended with a faintness of the whole soul, which is not soon nor easily relieved. And indeed hence it is, that the aforesaid disorders in Transpiration do chiefly arise, in as much as the sensitive Soul, being not either strong enough, or not well guarded, is too much exposed to the injuries of the external air; and consequently upon the brisker appulse thereof, is disturbed either in this or that part, or in its whole substance at once, and forced into disorders which are not easily allayed. Moreover hence also it is, that the flamy part of the soul is usually affected and disturbed by consent no less than in it self, through the disproportionate accession of the Air. For the nervous fibres and branches being contracted into wrinklins and convulsions, do variously bind the bloud vessels, which are tied about by them, so that the bloud is put into inordinate floatings. And besides that, the mass of bloud of it self suffers very much for the faults of depraved Transpiration both in its heat and temperature. In respect of the former, the vital flame, which shines about the surface of the body is usually forced by any hard or sharp blast upon it to twinkle or tremble and divers inequalities, whereby the whole soul is shockt. And then it is well known that the mixture of the bloud is not in more danger from any thing than from a vitiated transpiration: for from hence proceed those dissolutions and precipitations of the Serum in the mass thereof, by which Catarrhs, Coughs, Asthmatick, Nephritic, and Athritic Fits are caused.

From what I have said it will be easie to shew you the true nature, with the causes and cure of the Distemper, which we now treat of. For when any one contracts a pain or a numbness, or a palse on the sudden in any member, through the approach of cold or the open Air, the reason of it is, because the animal spirits that abound in the membranous fibres, being smitten and put to flight, are driven into distractions; and if, besides that, there happen upon such an occasion a languishment in the whole body, and a weakness in the parts, not onely one party of the spirits, but the whole substance, or the sensitive soul in general, seems to suffer for it. Which being smitten and thereby contracted and shortned into a lesser compass, sinks within the organs of the body, and suffers the faculties thereof to grow lank or slack. But, more then all this, if any one that is carelessly exposed to the Air, happens in a short time to have a swelling, Inflammation, Tooth-ach, Catarrh, Cough, or Pleurisie, or if a Chilnes comes upon him, attended presently with a Feverish heat or burning, it is a sign that the bloud no less than the animal spirits is affected by the disproportionate appulse of the Air, and consequently that the liquor thereof being either disturbed in its motion or heating, is disposed toward feverish ebullitions, or being dissolved in its mixture, is forced to va-

rious

rious fusions and precipitations of the serous liquor. It would be in this place a vast and a painful work to describe all those distempers, which sometimes owe their original to such a cause. Hence oftentimes comes the Headach, swimming in the brain, Drowziness, Catarrhs, Inflammation in the Eyes, the Quinzy, Blear-eyedness, the Cough, Vomiting, Loosness, and a thousand other Maladies, in so much that the Vulgar use to reduce the evident causes of almost all Diseases to these two heads, to wit, Hard drinking over night, and catching cold.

I have hitherto described the formal reason, and conjunct causes of Perspiration; but as to the precatartical or predisposing cause of it, by reason whereof some are more apt to catch cold than other some, I affirm, that this consists either in the vitiation of the animal spirits, or of the Blood, or Pores, that is to say, of one or more of them together.

1. The animal spirits are sometimes in fault, because being very weak, they cannot endure any hard or rough thing that is outwardly applied to them, but are immediately upon the appulse of the open air, put into flights and distractions; as many People after long sickness are afraid to stay in the air, and as soon as they go out of doors, many times fall into relapses. Moreover the Spirits sometimes incline to, that disorder in Sweating, in as much as being degenerated, and having gained a sharp and restless nature, they are put into disorders upon every approach of the air. Wherefore those who grow hypochondriacal by reason of their spirits being so disposed, are likewise obnoxious to the distemper which I have described, and are disturbed with cold upon every slight occasion.

2. The Blood disposes us to the habit of a depraved Transpiration upon a double account; to wit, both in respect of its temperament, and the mixture of it. As to the latter, the constitution of the blood is oftentimes so loose and dissolute, that it is altered upon every little occasion (and especially by the appulse of the cold or humid air) into fluxions and precipitations of the Serum; in so much that those who have such blood, dare not by any means to go abroad, or scarce so much as even to look out at their Windows. But the mass of Blood being often hot and very vaporous in its temperament, exhales such particles as are excessive sharp and penetrating; by which whilst the Pores of the skin are too much opened and made wider, not onely the spirits, but the vital flame are exposed, more than they ought to be, to the injuries of the open air and the wind.

Thirdly, An ill constitution of the Pores, proceeding either from sickness or otherwise, or which is natural and inbred, inclines very much to this habit of depraved sweating. For if those passages are too wide, and almost always gaping, the blood and spirits are not sufficiently guarded in the whole or certain parts, against the appulse of the external air. Such a wideness of the Pores is in some men inbred and natural, as in those that have a soft and loose skin; their skin is commonly thin and very porous. It also is usually contracted by several sorts of accidents: as, after a sweating Diet continued for a long time, and likewise after frequent sweats, that use to break forth about the declinations of Fevers, the Pores of the skin being a long time extended and widened, gape a good while after, and continue more open almost always.

This Malady, though it do not threaten death, yet because it renders a mans life very uneasy, or altogether useless, it very well deserves a Cure; in order whereunto three things are most chiefly to be taken care of; to wit, first, that the weakness or dejections, or depauperations of the spirits and the blood be remedied. Secondly, The ill temper of them both (if any such thing there is) be removed. Thirdly, That you cause a due conformation of the Pores.

1. The main matter in this affair, is to look after the first intention, as far as that concerns the corroboration of the animal spirits, or the enlarging of the whole sensitive soul: for unless you can persuade the Patients to take courage so far as to attempt going out of doors, exercising their utmost strength, and accustoming their nature to aspire unto things that are more difficult every day than other, all Medicins are in vain; upon which account they will want good Diet and cheerful company, as much as Physick; that the quantity of animal spirits may be daily renewed and augmented, and more than that, receive new strength from repeated and greater attempts: to which ends generous Wines, and delicate Victuals, in moderate quantity, are very conducive. And again, They must lay aside all study and care (whereby the soul is depressed) and spend their time in sport and recreations, or moderate exercises. By such a kind of life as this, rightly mannaged, as the animal spirits are very much refreshed, so the decays and impoverishments of the Blood, are restored.

Pbar. Rat.
Part I.

The Original of this Disease consists,

Partly in the Spirits;

Partly in the Blood.

3. An ill constitution of the Pores.

The Cure of it;

1. The first Intention is the corroboration of the spirits.

Phar. Rat. For the same ends also the following Medicins may be given with good success.
Part I.

A Spirit.

Take of *Succinum Ammoniacum*, a convenient quantity, and let the Patient take from xv. to xx. drops, at night and early in the morning, in a spoonful of the following distilled Water, drinking upon it ix. spoonfuls of the same.

A Distilled Water.

Take of the Leaves of Sage, Rosemary, Thyme, Savory, Marjoram, and Coastmarray, each iv. handfuls, of the Roots of Angelica and Masterwort, each $\frac{3}{4}$ lb. of Zedoary, the lesser Galingal, Sweet Cane and Orice, each $\frac{3}{4}$ lb. of Cubebs $\frac{3}{4}$ lb. of Nutmegs, Cloves, and Cinnamon, each $\frac{3}{4}$ lb. the outward rind of xij. Oranges and vi. Limons, cut them, bruise them; and pour to them of White Wine and Canary, each iv. pints. Distil them in the common Instruments: mingle all the liquor and sweeten it with Sugar of Pearl. In the distilling of it hang in the top of the Limbeck a little bag of $\frac{3}{4}$ lb. of Amber grise, and $\frac{3}{4}$ lb. of Musk.

A Tincture.

Take of the Tincture of Antimony or Balsam of Tolu $\frac{3}{4}$ lb. and let the Patient take from xv. to xx. drops in the morning at nine of the Clock, and five in the afternoon, in a spoonful of the Water prescribed, drinking thereupon $\frac{3}{4}$ lb. of the same, or rather in the morning let him drink upon it a draught of Tea, or Coffee, or Chocolate made with the Decoction of Sage.

A little before Dinner let him take a draught of Sherry.

When you have used these Medicins for some time, and have a mind to leave them off, take these that follow in their stead.

In the room of the Spirit take a Dose of the following Electuary every night and morning, with the distilled Water, or Viper Wine.

An Electuary.

Take of the rind of Citron wet preserved $\frac{3}{4}$ lb. of Myrabolans preserved $\frac{3}{4}$ lb. of Nutmeg and preserved Ginger, each $\frac{3}{4}$ lb. of the Confection of Facinth and Alehermes, each $\frac{3}{4}$ lb. of Pearl prepared, and of red Coral prepared, each $\frac{3}{4}$ lb. with Syrup of the juice of Cherries: and make an Electuary.

Physick Ale.

For your ordinary Drink take Physick Ale, prepared in manner following; that is to say, into a Vessel of iv. Gallons put the following Bag:

Take an old Cock half-boyled and cut into small pieces, and of the Leaves of Sage and Harts-tongue dried, each ij. handfuls, Dates shredded in number vi. of the shavings of Sassafras $\frac{3}{4}$ lb. shred them and bruise them, and then mix them, and make a Bag, to be put in after the Ale hath done working.

2. The second Intention.

2. The second intention, that undertakes to mend the ill temper or depraved nature of the spirits and the blood, is performed by the same remedies, which are proper in the hypochondriacal and melancholy Distemper; wherefore from the Cure of those Diseases, which I have formerly set forth, the Forms of their Prescriptions may be made use of in this place.

3. The third Intention, which is, the alteration of the Pores.

3. As to the third Intention, which instructs us in the due Method of using Cloths, Air, Fire, and Food, for the regulation of the Pores, it doth not much concern a Physician. For the Parties affected, measuring themselves and their strength according to their own imagination, put on such Cloths, keep themselves close up in their Chambers; lie in Bed, and sit by the Fire, even as long or as much as they please, never hearkening to the advise either of Friends or Doctors. Whatever other People tell them concerning those things, they for the most part reject in confidence of their own experience, and the good or hurt which they have found. The onely counsel that they most commonly use to take, and is most helpful, is this, that they ought to change the Air and the Soil where they live, which oftentimes alters their minds also. For let them be never so imprisoned in their Houses or close Chambers, yet when they go into foreign Countries, where they breath in hotter and more serene Air, it is hardly credible how soon they recover. So much of depraved or perverted Transpiration; the Theory of which Distemper, I therefore delivered the more fully, because it is left untouched by others: Now let us return thither, from whence we digressed, and treat of excessive Sweating. There

There remains still another sort of this Distemper, called immoderate Sweating, which is, not as the former, an effect or symptom of any present or past Disease; but is at the very first beginning either a Disease by it self, or the Parent of some morbid Distemper. To the former of which belongs chiefly that pestilent Sweating, which was heretofore amongst our Countrymen, and therefore through the whole World called by the name of *The English Sweat*; into the cause of which we will by and by inquire. But to say nothing here of the bloud, black, or blue foetid, or sweet Sweat, (of which good Authors make mention, and of some whereof we have now and then made observation) I have often taken notice, that some People have fallen into an habit of sweating, without any manifest cause; and then that the evacuation being daily augmented, hath increased many times to great excess; in so much, that the moisture (of the whole Body seemed to be poured forth into Sweat. And indeed it is no wonder that this Distemper, when it is once begun, should daily augment; for those that sweat much or often, are very thirsty, and consequently drink to excess, and so the more they drink the more they sweat: by which means these two do mutually take the turns of the Cause and the Effect, and by a long series produce one another. There lives yet in this Kingdom a noble Lady, famous for her extraordinary, or rather stupendous sweating these many years last past, who every night doth not onely wet, or rather deluge her Linen and all the cloths about the Bed, but likewise puts a Basin under her thighs, into which several ounces, nay according to the vulgar relation, several pounds of meer Sweat drop from her; and in the mean time she is forced by her continual urgent thirst, to drink more than ordinary, whereby as her strength is restored, so her sweating is prolonged. I had the story of this strange indisposition, not onely from other persons of good credit, but from the Ladies own mouth, though I never was consulted in order to the recovery of her health. But she took several remedies from several Physicians, tried many methods concerning Diet, and the regulation of the Six Non-naturals, drank Waters of almost every kind, and tried the Air of foreign Countries, especially of *France*; but notwithstanding all this, the Noble Lady is still troubled with this extraordinary dropping. Now seeing I have yet known nothing of what happened about the beginning, progress, and alteration of this Distemper, or what was observable concerning those things that gave her ease or pain, and that I had the honour only once to see, and talk with her no more than just *en passant*, it will not be easie for me to give you the reason of this case: but however I may be allowed to guess, that in this, as in other instances of Nature, the *Serum* of the Bloud being apt to separate too easily, left the ordinary passages of evacuation through the reins, lymphæducts, and other ways, and having first occasionally begun to go this way through the pores of the skin, and afterward facilitated its motion by a kind of habit, affected, and constantly observed the same; to which perhaps we may add, that the predominancy of the fluid Salt in the bloud and nervous juice, causeth a continual fusion of the Bloud, and a plentiful separation of the *Serum*. To cure this Distemper, now since it is confirmed by a long habit, and that the œconomy of Nature also is quite inverted by it, I cannot tell whether any Medicins or Method of Physick would do any good upon her. For my part, I did not think fit to propose any to her, when I had formerly the opportunity to speak with her. If that great Remedy for a vitiated Transpiration, to wit, Change of Air, be repeated, I would have her go no more to *France*, but *Denmark* or *Swedeland*.

Phar. Rat.
Part I.The third sort
of sweating,
which is a Dis-
ease of it self.A notable Sto-
ry of it.

The reason of it.

It would be pertinent in this place to treat a little concerning *the English Sweat*, of the English which was formerly so rife, not onely among our Countrymen at home, but also abroad, and that in a very fatal degree. But yet seeing this Distemper hath not been known within an Age last past, and we cannot know the nature of it but by the Writings of others, I must not contrive any Hypothesis concerning the nature and causes thereof, but onely after the Story, which I take of it out of Authors, lay before you my own Conjectures.

Of the English
Sweat.

The *English Sweat* began in the year 1485, about the beginning of the Month *August*, and continued to the end of *October*; and though *Sennertus* saith that this Malady was from that time 40 years familiar and continually in this Country, yet our Countrymen, both Physicians and Historians, who lived either at that time or near it, observed that it had perfect and great intervals: and when it returned only four times in the space of 66 years, to wit, in the year 1506. 1517. 1528. 1551. it raged scarce ever above 6 months, and sometimes was gone in 3 months time, and that there was always a very wet season before it came. But every year that it was rife, it destroyed a vast number of men in all places, in so much that when and whereever it reigned, a third part of the People were missing in a short time. So great was the malignity thereof, that as soon as it invaded any City, it would every day seize upon five or six hundred persons, and of those

The Story of it.

Phar. Rat. those that were sick at first, scarce the hundredth man escaped. I thought good here to insert that compendious and methodical description of this Disease which *Sennertus* hath given us, and which is also consonant to that of our own Authors. Those that were seized with this Distemper, were presently weakened without any Bubo, Carbuncles, Breaking out, or Languidness, and fainted in their Spirits with extreme feebleness in their limbs, restlessness, heart-burning, head-ach, frequent, quick, and unequal pulses, with very great palpitation of the heart; but they flowed with perpetual and copious Sweating, which was not ended before the Distemper was over, which happened within 24. hours. For those that did not provoke Sweat, nor use Cordials, and those that endured heat more impatiently and caught cold, they all died suddenly within 24. hours. But afterward when the nature of this Distemper was known, and that it did People good to provoke Sweat and use Cordials to fortifie themselves, fewer died of it. [*Sen. of Fevers* b.4. ch.15.] Concerning the Cure of it *Polydore Virgil* writes somewhat more accurately. After many Experiments and Observations made by the sick, from things that were helpful and hurtful, it came to pass at last, that they found out a present remedy for each person, which was this. If any man were taken with Sweating in the day time, that he should forthwith go to bed in his cloths; if in the night and in bed, then that he should lie still, and not stir out of the place for four and twenty hours together; and that in the mean time he should so load himself with cloths, as not to provoke the Sweat very strongly, but let it drop gently from him of its own accord; that he should eat nothing, if he could endure to abstain so long; nor drink more of his usual warmed liquor, than was moderately enough to quench his thirst. But all the while that he was about this Cure, he should take care not to put so much as his hand or his foot out of the Bed to cool or refresh them, which to do is mortal. Others say, that all that space of a night and a day, the Party was totally to abstain from sleeping. This Distemper, because it usually ended, after so short a time, in life or death, was called by many Physicians, *Febris Ephemera*, or a Fever of a days continuance. Those that recovered of this pestilent sweating, after they had continued for a time well, fell many of them into it a second, and some of them also a third time.

The Description of it out of Sennertus.

The Cure of it is described out of Polydore Virgil.

The reason of it is inquired into.

The primary cause of it.

In the nervous liquor.

From these appearances, that we may presume to give you the reason of this dire Distemper, in the first place we may guess, that the formal reason, and likewise the conjunct cause of that pestilent sweating consisted in this, that the Bloud being infected by meeting with some malignant or venomous matter, and consequently thereupon dissolved in its temperament, and melted into *Serum*, was immediately put into a sweat, (as being the universal, and also the most copious way of evacuation) in order to expel that virulent mixture; by which evacuation, if perchance it happened that all the venomous particles were straight carried off, the Distemper ended in a short time with health, but otherwise very often with death.

But here I must in order make inquiry, whether that malignant matter was first generated in the Bloud, or whether it flowed into it from other parts? If you say the former, you must suppose that the mass of Bloud, as in the Plague, had contracted a putrefactive quality by the malignant constitution of the season and the Air; which afterward, either of its own accord, in as much as it, was raised to a fulness, or by contagion, did, as it had been set on fire, break forth into a dangerous, and oftentimes corruptive swelling. But that which makes me not believe it to be so in this malignant Sweating, is this above all other things, that no signs appeared either before, or after, or in the fit of the Blouds being corruptive or much vitiated. For besides that this Fever is not very high, nor attended with Spots, Breakings out, Buboes, and other signs of the Blouds being venomous or in a great heat, it also is over in a night and a day; which scarce ever uses to happen in Distempers that are deeply rooted within the mass of Bloud.

Wherefore I am rather inclined to think that the original cause of this Distemper, being first founded in the nervous liquor, is from thence communicated to the bloud, whilst the tragedy of this malignant sweating is transacted. For I suppose that the aforesaid liquor, which moisteneth all the fibres in the whole Body, and is the vehicle of the animal spirits in all parts, is degenerated, through the unseasonableness of the year, from its due crasis, that is to say, from its spirituo-saline volatile nature, toward a sower, or other more vitiated, and at last, malignant quality; and when it comes to that state of depravation, that either of its own accord, through fulness, or being stirred up by the ferment of the contagion, it begins to swell, or dissolve, being forced out of those irritated parts, and flowing into the mass of Bloud, it presently poisons it throughout, relaxeth the constitution of it, and puts it into a most excessive heat, or boiling, in order to expel and throw that off. Hence plenteous Sweats (because this

this is not onely the nigheſt but the largeſt way of evacuation) break forth; by which extreme endeavour of Nature, if perchance it ſo happen that all the poiſon is remanded out of the blood into the habit of the Body, and that thence it be quite caſt out by an univerſal and ſometime continued Sweat, health in a ſhort time appears; like Sun-ſhine after Clouds are totally diſperſed; but if the venomous particles are not ſuddenly nor altogether routed by that fermentation and endeavour to ſeparate them, into which the Blood is put, in order to expel the malignant matter, the maſs of Blood becomes, not onely by being deprived of its *Serum*, but vitiated, and overpowered in its Nature, unable any longer to prolong, or keep in the vital flame.

From hence it will be no hard matter to aſſign what are the cauſes of its Symptoms, and the reaſons of the empirical or quack Cure thereof: For whereas when the Diſeaſe was upon them, or about the firſt approach of it, before the Fever ſeemed to be kindled, immediately an unuſual languiſhing, a faintneſs of the ſpirits, a great weakneſs in the limbs, an headach, palpitation of the heart with frequent, quick, and unequal pulſes, and other indiſpoſitions in the nerves did afflict the perſons that were ſick of it, it was a ſign that the nervous parts were affected or put out of order before the blood, and that from them the malady derived its original.

2. Whereas plentiful Sweat (which was not onely ſymptomatical, but ſometimes alſo critical) ariſes about the beginning of this Fever, quite contrary to what it doth in moſt others, the reaſon is, becauſe the morbiſick liquor which flowes out of the nervous fibres and other parts into the maſs of blood, is thence immediately thrown back upon its very firſt arrival, nor is it permitted to ſtay any conſiderable time in the blood, or to be intimately mingled therewith. For when a man is not very well, the nervous liquor ſcarce ever agrees with the blood; wherefore if at any time that flows into this, it is preſently forced out again, and being, before it is infected with the leyiſh tincture, ſent away through the reins, it cauſeth a flux of clear Urin; which I have often obſerved to happen in convulſive Diſtempers. But if the nervous liquor being degenerated or depraved, flows back continually into the Blood, it produces ſometimes an unbloody Flux or Dyſentery (ſuch as I before deſcribed) and ſometimes a Diabetes, as I ſhewed you in the foregoing Diſcourſe. But I have formerly evinced that cancerous ſtrumous, ſchirrhouſ, and other ill tumours do ariſe by reaſon of the leſſer and more private ſerlings or ſtagnations of the ſame humour. Now in the Diſtemper, of which we at preſent treat, that nervous liquor, if it be very malignant and peſtilent, it poiſons the Blood at the firſt touch, and diſſolveth it into a *Serum* which muſt be immediately carried off by Sweat; for otherwiſe if it be ſuffered to ſtay ſome hours in the maſs of Blood, to circulate, and be intimately commixt with it, it totally corrupts, and plainly mortifies the ſame: hence in that method of curing it, found out by frequent experiments, they take ſuch diligent care, that upon the firſt approach of the Diſtemper, the Parties that are troubled with it are the ſame moment (without ſtaying to pluck off their cloths, or to go into bed) covered all over with the Bed-cloths and compoſed to ſweat, continuing thereupon an equal ſweat through their whole Body, for 24 hours; in ſo much that in the meantime they are not ſuffered to ſtir hand nor foot, or to take either meat, or ſleep; that is, they do nothing at all, to make that peſtilent liquor mix either in greater quantity or more intimately with the Blood, or to hinder the ſudden and total excluſion thereof. Now if ſuch ſudden, plenteous and equal ſweating cauſed by the inſtinct of Nature and regulated by Phylick, be continued ſo long, that all the venom exhales through the pores, of the ſkin, the Patients perfectly recover without breakings out in the ſkin, a lingering Fever, long weakneſs, nightly ſweats, and other conſequences of vitiated Blood. But in as much as the nervous liquor, after its corruptions are ſo purged forth, is apt again in the ſame manner to be depraved; and after that, being diſturbed through fulneſs or contagion, to flow back out of the nervous parts into the Blood, and to envenom that likewiſe, it therefore happened, that ſome men after they were perfectly well, were ſeized by the ſame Diſtemper a ſecond, yea ſometimes a third time. It will not be neceſſary here to ſubjoin any forms of Preſcriptions in this caſe, becauſe the whole buſineſs of the Cure depends for the moſt part upon a right ordering of the Patient. Beſides it would be very abſurd to preſcribe a remedy or a method to cure a Diſeaſe that is ſo unuſual among us, and which we hope will never return again; or if perchance it doth hereafter come upon us again, it is uncertain, whether we ought to obſerve the ſame rules in curing of it.

Phar. Rat.
Part I.

The reaſons of
the Symptoms.

An unbloody
Dyſentery and
a Diabetes pro-
ceed from the
ſame cauſe as
this Diſeaſe
doth.

S E C T. VI.

C H A P. I.

Of Cordials and Antidotes.

Cordials and Antidotes have been always of the most common use.

IN the ancient way of Practice among Physicians, and even to this day, according to the vulgar and empirical Method, which Women and Quacks take, the Medicins called Cordials and Antidotes have been almost of the most common use and greatest esteem. The Simples of them are very numerous, their Compositions add bulk to all the Dispensatories both Ancient and Modern, and fill almost every page: But as to the reasons of their effects and manner of operation, to wit, upon what kind of particles their virtue depends, and how they exert their power upon the heart or blood, or spirits, or other humours; upon this subject, I say, I find nothing said any where, either by Physicians or Philosophers, that may satisfie a mind desirous to know the truth. For the explication of the virtues of Cordials, they do not insist, as in other parts of practical Physick, upon their manifest and sensible qualities, but have recourse to occult and specifick actions, yea to those of the whole substance: When in the mean time, if you consider the thing aright, and dive into the genuine and true reason of it, it will be very evident, that the very notion of Cordial remedy goes altogether upon false ground, and is a Vulgar Errour.

Their common Attributes.

Such Remedies are called Cordials, as by any means relieve the Heart [which in Latine is *Cor*] when it is out of order; wherefore they are said, by many Authors, one extraordinarily to comfort the heart, another to preserve the heart from all putrefaction, and others also to support the heart when it is weak or oppressed, to heal the trembling or faintness thereof, and to keep it from corruption. Moreover because in the Plague, the small Pox, and malignant Fevers, the heart is supposed to be seized or beset with poison or malignity, the remedies therefore that are usually good in those Distempers, are not onely called Cordials, but Antidotes also.

whence Remedies that preserve Life are called Cordials.

This opinion concerning both Cordials and Antidotes, seems to have sprung from that ancient supposition, which even to this day obtains among the Vulgar, to wit, that the heart is the fountain of all life and heat, and consequently that our health or death depends upon the immediate well or ill being thereof: and hence it is that whatsoever refreshes the soul, and makes us vivid and chearful, are believed to do so by being benign and kind to the heart; and on the contrary, other things are thought to cause sadness and melancholy, so far as they are enemies and disagreeable to it.

They do not act properly upon the Heart;

But indeed, seeing I have elsewhere shewn at large, that the subject of Life is not the heart by any means, but chiefly, and almost only the Blood, and that the very Soul it self (upon whose existence and action in the Body the Life depends) is founded partly in the Blood, and partly in the animal Spirits, it will easily follow, that the Remedies which preserve the Life entire, or restore it when decaying, respect these parts of the Soul, to wit, the Blood and animal Spirits, rather and more immediately than the Heart: For this is not so noble and principal an Entral as it is commonly said to be; but a meer muscle, consisting onely of Fleh and Tendons, as the rest do, and serving for the driving of the Blood about: but as often as it is defective, or fails in the right performance of this duty, this doth not happen properly through its own fault, but the irregularity either of the Blood or animal Spirits whereby it is actuated.

But upon the Blood and animal Spirits.

Wherefore that the reasons and manner of operation of those Medicins, which are called Cordials, may appear to us, we must consider these two things; to wit, First how many, and what ways most chiefly, the Blood, when it is disordered either in its heat, or mixture, and oftentimes in great danger, requires medicinal supplies to preserve or mend its constitution. Secondly, How either through defect or error in the vital functions the Heart is hindered, or perverted from its due motion, and therefore such Medicins are proper, as may augment the quantity of Spirits, and put them into a better temper.

Now upon the Blood.

As to the first, The Blood, in respect of its heat, is either deficient or excessive; and in both cases different sorts of Medicins, to wit, hot or cold ones, (which are like Oil or Water) are required; and therefore they are commonly called Cordials,

dials, though they do not at all affect the Heart. For though, after taking of them, the motion of the Heart is oftentimes altered, and therefore the Pulse immediately grows more swift or slow, more strong or weak; yet this is because the motion of the Heart, depending altogether upon the influx of the animal spirits (by a wonderful consent and sympathy between both parts of the Soul) is exactly proportioned to the heat of the Blood: wherefore as the Blood increases or remits its effervescence or boiling, by Medicins taken in, immediately the animal Spirits that agitate the Heart, submitting very readily to the condition of it, make the Heart beat faster or slower; and then if the train of animal spirits be affected by the same Medicin, the Pulse thereby is made more or less strong or vehement; when in the mean time the virtue of that Medicin comes to the heart it self, no more than to the hands or feet, or any other muscle. Wherefore that we may rightly settle the first rank of Cordials, whereby the enormities or irregularities of the Blood are healed, we must consider how many, and which ways the liquor of it, both as to its heat and temperature, is usually perverted or depraved, and after that, what kind of Remedies, commonly accounted Cordials, are requisite for the several Distempers thereof.

Phar. Rat.
Part I.

The Blood is faulty in its heat and temperature.

First therefore, the Blood sometimes is not hot enough, nor doth it circulate vigorously, as you may observe in many languishing People; that is to say, such as have been long sick, or suffered any great loss of Blood, or other immoderate evacuations, or are worn out with age, whose Pulse is weak, their limbs infirm, and their extreme parts cold and pale: the reason of all which is, because the Blood, when the sulphureous particles are too much consumed, and depressed, is become almost vapid and spiritless; and consequently it is heated in the Lungs very sparingly and weakly; to which oftentimes as an addition, it happens that the vital functions growing weak, the heart which wants a more full influence of the animal spirits, doth not sufficiently exagitate the Blood so as to put it into a more vegete effervescence or brisk heat.

1. How it becomes less hot than it should be.

The Remedies that are to be used in this case, are generous Wines, hot Waters, or gentler liquors distilled with Spices, Powders, Species, and Aromatical Confections; Oils and Spirits chymically prepared; Tinctures, Elixirs, and other things impregnated with sulphureous and spirituous particles, such as may put the Blood into a greater motion, and render it more inflamable and turgid or swelling: and seeing the same things do at the same time exsuscitate or rouze and comfort the animal spirits, they therefore make the heart beat more vegete and strongly. The Receipts of these shall be added in the end of this Chapter.

What Remedies are proper.

Secondly, Oftentimes the Blood, by reason that the sulphureous particles of it are too loose, and put into an effervescence, is kindled more than it should be, and scattereth an extraordinary and very offensive heat over the whole Body: wherefore to the end, that being so very much rarefied, and inflamed, it may be kept within its vessels, and at the same time cooled, the heart beating vehemently and swiftly, drives about the blood with great labour and pains: and therefore in this case Cordials which are cold and attemperative (to reduce and allay the fervour of the Blood, and at the same time gently to refresh the animal spirits, that they may perform the task of life which is now more difficult) are most proper; to which ends Distilled Waters of Burrage, Balm, Cowslip-flowers, Marigolds, the rind of a whole Citron, and likewise Syrups and Conerves made of the Flowers and Leaves of such vegetables, the juice of Sorrel, a Citron, Oranges, Chrystal Mineral, and the like, use to be looked upon as good for it; to which Opiates oftentimes are added with success; for when the violence of the hearts motion is somewhat rebated, the blood more easily and the sooner remits its effervescence or boiling heat.

2. And what also when it is too hot.

These are the more simple Cordials, which are designed onely for one intention, to wit, the increasing or diminishing of the bloods heat. But besides this, the blood uses also to be depraved, and divers ways perverted not onely in its heat, but also in its temper or mixture: Though Cordials are not presently requisite upon every disorder of it, but onely in those which being caused by Fevers, and also very sudden and violent, threaten the corruption of the whole mass of blood.

2. The Blood being vitiated in its temper or mixture requires Cordials onely in Fevers, and then,

1. The Blood, when it boils up in a feverish indisposition, is in danger, as to its temper these two ways: that is to say, either the bond of mixture is too strict, and consequently all the particles are so complicated among themselves, and mutually fastened, that the nourishment cannot by any means be disintangled, or separated from the excrement, and the thin part from the thick; as it happens in some continued and putrid Fevers; which though they are little or not at all malignant, yet because they can have no judgment made upon them by Sweat or Transpiration, they sometimes end in death. Wherefore in this case you must use such Cordials as loosen and open the Constitution.

It is either too strict and close in its constitution,

Phar. Rat. tion of the Bloud, so that the serous liquor with the other recrements, may separate and be carried off from the body of the rest.

Part I.

Or too loose.

2. The temper of the Bloud is in danger also another; and that a quite contrary way, to be subverted in Fevers, and consequently Cordial Remedies of another nature, to wit, Antidotes [or Medicins given against corruption, or venom] are most proper. For it often happens that the constitution thereof is too much loosened, and divided as to its temperature, by heterogeneous or foreign particles, which are either generated within it self, or flow into it from other parts, in so much that when the common bond of mixture is dissolved, it all disunites into several parcels; and then the portions of coagulated; or extravasated, and stagnant Bloud which are settled here and there, putrifie and are corrupted; and at length the whole mass of Bloud is so far vitiated, that it is no longer fit to keep in the vital flame, or to convey the animal spirits gently into the Brain: whereupon at that time all the vital functions must of necessity decay, and at last life it self be extinguished.

*what remedies
this latter fault
requires.*

In this case the Cordials, which are most requisit, must consist of such particles, as being transmitted into the Bloud, and circulating along with it, may be untameable all the way, but at the same time, benign: upon which account, whilst they get into all the pores and passages of the Bloud, they do in all places disturb the other malignant particles, force them from their combinations, and at last either subdue or drive them out. And when by that means the Bloud being delivered from that venomous mixture, and also freed from all private coagulations, is again divided into small elementary particles, it recovers its former, and in a short time, an healthful mixture.

*To wit, Anti-
dotes.*

Now that you may the better understand how Antidotes preserve the Bloud and other juices of our Bodies from pestilent Infections, and recover them from corruption when they are already touched therewith; you must consider how other liquors that are subject to putrefaction, may be long preserved, or being seized by it, may be again restored. To which end you may observe of Ale, that though in its own nature it be apt quickly to grow sower, yet by boyling of Hops in it, you may make it keep a great while: yea, that common Water, though it would otherwise putrefie in a short time, yet by boyling or infusing of bitter Vegetables in it (such as Antidotes also are) it continues for a long time untainted: again, that some juices of herbs, and several other liquors, which are already corrupted, if they are smoaked with burning of sulphur over them, recover their former vigour: so also that Wines, Ale, and other sorts of Drink, which are almost vapid and spiritless, do oftentimes revive again by a fermentation newly put into them. The reason of all which is, because, seeing the corruption of every thing consists in the dissolution of the elementary particles, and their mutual departure from each other, what ever keeps them still in motion and perfect mixture, when they tend toward flight and confusion, keeps that body yet tite and whole. Moreover, whatever forces the Elements when they are dissolved from each other, and would mutually depart, to a fresh union, and stirs them up to a new fermentation, drives away all putrefaction from the body, though it were begun in it, and gives it again a firm constitution. All the Vulgar know that such alterations as these, and such recoveries from corruption are caused with liquors prepared by Art. And indeed Antidotes seem to have the same effect in the Plague as in malignant Diseases. For they being often taken, in as much as they continually stir the Bloud and force it to an higher fermentation (notwithstanding the influence of the noxious corruptive particles) keep the mixture of it entire; yea after the malignity is impressed upon it, and that the temper of the Bloud, in manner aforesaid, begins to be relaxed and dissolved, those kind of Remedies, being given till they promote Sweating, do oftentimes deaden the force or impressions of the pestilential malignity, in as much as they digest the putrefactions of the contagion received, and introduce a fermentation opposite to that other corruptive quality. The sorts and forms of these Antidotal Medicins shall be laid down hereafter.

*what Cordials
are most proper
when the temper
of the bloud is
too close.*

In the mean time, as to those other Cordials, by which the constitution of the Bloud when it boyls up, is relaxed from its extraordinary closeness, and opened to free the feverish matter and other recrements thereof; to give you a more satisfactory account of their virtues and the manner of their operations, we should refer to this head what formerly hath been said concerning the effects of Diureticks and Diaphoreticks. For those Medicins are very nearly related to some Cordials, yea they are sometimes of common and mutual use; in as much as the crasis or mixture of the Bloud, when vitiated, cannot sometimes be relieved, unless you first loosen the temper of it, and make way for the serous liquor to be carried off through the reins or pores of the skin. All these ends of Physick are chiefly obtained by salt Medicins. For, as I have formerly

often

often observed, the opening of all bodies, whether liquid or solid, is for the most part performed by a saline Key. *Phar. Rat.*

Part I.

How the curdling of Milk and reducing it from that state, or the hindering of it is brought to pass by the various infusions of salt bodies, and how much resemblance it bears to the blood, I have declared by Experiments in the Chapter of Pissing, or concerning Diuretick Medicins: and as it is in Milk or fluid Blood, so also it is with the most fixed Metals and other Minerals. For almost all concretions or combinations in Bodies proceed from a Salt of one kind, as the dissolution of them doth from some one of another kind, which forces the first Salt into its embraces, and then the precipitation is caused by a Salt of a different nature, which destroys the union of the two former; all which I have so clearly and fully explained above, that there is no need in this place to repeat it. Wherefore, that we reckon saline Medicins among Cordials as well as Diureticks and Diaphoreticks, the reason is the same in all: all that I have now to do, is briefly to lay down the chiefest sorts of this kind, that belong to that Head, together with the manner and reason of their operations.

They are most commonly salt ones, and that of different sorts.

1. Now therefore in the first rank, such Cordials as are impregnated with volatile Salt present themselves, and easily bear the Bell away from most others, as Spirit of Harts horn, Blood, Sal Armoniack compounded, to wit, with distilled Amber, Treacle, Roots of Virginia Creeper, and other Antidotes; as also (that which was the onely and universal Medicin of a Doctor of Physick that turned Quack) the Spirit of Sculls dug out of Graves: Hither also we ought to refer the Salt of Vipers, and likewise Powder of Toads close calcined (which I formerly, in a pestilential Fever which was Epidemical at Oxford, in the Year 1643. knew to be famous and very good) with many other things. This kind of Remedies have recalled many people from the very jaws of death, and indeed do often afford help upon a different and manifold account; that is to say, first of all, in that they meet with either a fixed or acid Salt, which they force into their embraces, and thereby open the mass of Blood which is too much thickened and bound together by the feverish effervescence thereof, in so much that they promote the separation and expulsion of the morbidick matter; and then again, in regard that they relieve and comfort the animal spirits, and rouse them, when they are sluggish, to the discharging of their duty; to which you may add as a third virtue of them, that in malignant Fevers these Medicins subdue the venomous particles of the morbidick matter, and very frequently destroy them.

1. Cordials impregnated with volatile Salt.

2. The second place among saline Cordials is justly due to Remedies that are impregnated with Alchalisate or petrifying Salt; for these are commonly reckoned the most famous of that kind. Among which you may count *Lapis Bezoar* or the Bezoar Stone, Pearls, Corals, the Bone in a Stags heart, and horn of the same Creature, Powder of Ivory, Eyes and Claws of Crabs, and other Powders both of Stones and Shells, which common experience tells us, are oftentimes given to sick folks with good success, and the reason why they are an help in such cases, seems to consist in this, that the particles in the Alkali Salt in the Medicin meet with the particles of acid Salt in our bodies, and forthwith mixing very intimately with them, must consequently destroy their violent motions, and all other hurtful combinations. To this Class of Cordials are duly referred Bole Armeniack, Terra Sigillata of Lemnos, and other Chalky substances also; but yet not for that reason, because they succour the heart when it is oppressed (as it is commonly believed) but for as much as they destroy the predominancies of acid or fixed Salts, either in the Bowels or the mass of Blood, and immediately allay or correct the enormities by them produced.

2. Such as are impregnated with an Alkali, or petrifying Salt.

3. If I should exclude sowerish Medicins, or such as are impregnated with a fluid Salt, from this rank of Cordial Medicins, the Authority of almost all Physicians, but especially the Ancients, would rise up against me. For these are by many Doctors reckoned extraordinary Antidotes against the Plague or pestilential Distempers. For the Cure of malignant Fevers, Vinegar of Treacle and of Bezoar are mightily commended; yea they put either Vinegar or something like it, into Waters which they distil for that use. For the same reason Spirit of Vitriol, Juice of Citron, of Allelujah, or Wood Sorrel, of Pomegranates, with many other things of the same sort, are reckoned among the number of Cordials; and indeed there is great reason they should be so, because they are the best dissolvers of fixed Salt and adust Sulphur, when they combine together and subdue their violent qualities, which is the reason that in malignant Fevers the coagulations and extravasations of the blood that use then to happen, are oftentimes prevented or cured by this kind of Remedies.

3. Such as have in them a fluid or a sower Salt.

4. For the same or the like reasons that the aforesaid Salt Bodies are numbred among Cordials, or Ingredients of such Compositions, you may add to that kind of Medicins such also as have a fixed Salt for their basis or foundation. For seeing there

4. Such as have fixed Salt in them.

Phar. Rat. are several sorts of Salts generated in our bodies, and that they frequently pass from one state to another; hence it is, that upon what occasion soever we ought not to give salt Medicins of any one, but of several kinds. How, and by what means such things as are impregnated with a fixed or lixivial Salt, do either destroy or correct the enormities of the acid Salt which is in our Bowels or our Blood, I have shewed you before.

such as have a Nitrous Salt in them.

5. The nitrous Salt is very justly reckoned among the number of Cordials, as being such a thing, that unless the particles thereof are breathed in along with the common air, the life of Animals cannot subsist: but this taken in at the mouth is looked upon as a famous Antipyreticon, or Antidote against heat, in that it quenches thirst, and mightily asswageth the feverish heat; which notwithstanding it doth, not onely by preserving the mixture of the Blood, but also by promoting the accension or kindling thereof. I have elsewhere shewn you, that nitrous particles as well as sulphureous ones, are requisite for the production of flame, and that the more plentifully they are administered so much the clearer and brisker it burns. Wherefore when the matter, which for the most part consisteth of Sulphur mingled with Salt and Earth, is kindled and gives but a glimmering shine obscured with Smoak and Soot, if you put nitre to it, it will immediately grow bright and clear. So I am of opinion it is in Fevers, when the Blood being filled with adust feculencies smoaks with a suffocating heat rather than burns out, if you take nitrous particles into your mouth and transmit them into your Blood, they will presently make it burn clearer, and consequently more kindly; in so much that when the constitution thereof is more open, not onely the serous, but also the fuliginous recrements thereof do more freely make their passage out. Wherefore my Lord Bacon rightly observes that the particles of Nitre not onely that are taken into the stomach, but such also as are breathed in with the common air, do very much conduce not onely to preserve but to prolong our lives.

These are the chief sorts of Cordial Medicins, whose operation is designed most peculiarly upon the mass of Blood, the constitution of which (when it is either too close, and thickened with long concoction) they do somewhat dissolve and open, to make way for the morbid matter; or they recover the Blood from putrefaction, when it is dissolved by any heterogeneous or malignant mixture, and divided into portions that are envenomed, and consequently obnoxious to corruptive stagnations and coagulations; in as much as the particles of those antidotal Cordials, being transmitted into the Blood, and confounded with it in the circulation thereof, (yet seeing they are not assimilated or subdued by it) do set upon the venomous particles on every side, and either subdue them or drive them forth; so that the mass of Blood being freed from all malignity, and extricated from every kind of coagulation, doth in a short time recover its former temper. Both these sorts of Medicins (in as much as they preserve the Blood from corruption or extinction) are commonly called *Cardiaca*, i. e. Cordials, but are more properly named *Vitalia*, Vitals, or the Preservers of Life.

But if it be further inquired, how either these or those, when taken into the stomach, transfer their operations so suddenly, and almost entirely into the Blood, without any notable action or passion caused in that same part; I say first of all, that such Medicins do not at all oppose, but very well agree with the animal spirits; wherefore they do not irritate or provoke the nervous fibres of the stomach either to a sense of pain, or any expulsive motion; but they rather excite the spirits that are in them to a kind of exultation and complacency, by the propagation of which, the whole soul is presently expanded into a greater breadth. And then again secondly, The passage out of the stomach into the blood is not, as it was formerly supposed, so long, or extended through so many turnings, as that we need fear lest the virtue of the Medicin should be lost by the way; but immediately it is transmitted from these into those quarters. For as I formerly observed, there are an innumerable company of blood vessels which cover the inner coat of the stomach, in so much that not onely purging Physick, but any other Medicins that are designed to work upon the heart, or brain, yea upon the outmost part or surface of the body, begin their operation upon the blood, even before they are got out of the stomach.

The second sort of Cordials, that respect the animal spirits.

So much of Cordials, as they are commonly called, so far as they restore or reduce the blood to a better temper; when either in its heat or mixture (the one or both together) it is depraved. Whose operation and virtue since it affords comfort to the life of man when it is in danger, they may (as I intimated to you) be more properly called Vitals. But besides this, there are some Medicins that go by the name of Cordials, in as much as they first and more immediately exert their operations upon the animal Spirits, and thereby raise, invigorate and compose either some portion of the sensitive soul, and the whole substance of it, when it is too much contracted, depressed,

or otherwise put into disorder. And indeed such Remedies as these do in some measure affect even the heart it self, though more remotely. For when by giving of them the whole sensitive Soul is raised, and expanded into a greater breadth, the spirits also which are designed for the heart, flow into it more copiously, and put it into a brisker motion; and consequently the Pulse, which was before but weak and languishing, immediately beats stronger, and the Blood is driven about with greater force. These kind of Medicins, which are not without some good reason taken for Cordials, do not much differ, as to their matter, from those other Vital Compositions which chiefly respect the Blood; yea, somethings are common to both kinds. As to the ways of their working, these last may be well enough reduced to two Heads, and in as much as they are either smooth, or rough and harsh, they attain the same end; that is, they either raise and comfort the animal Spirits by soothing, and as it were gently and softly touching or stroaking of them, or by vexing and provoking them as it were with Spurs and Goads, they force them into more rapid, and sometimes more regular motions.

The Cordials of the first sort, as soon as they are down in the stomach, yea sometimes by then they are got into the mouth, exert their operations, and with a grateful influence refresh and recruit the spirits that inhabit in the first passages, and as it were in the Portico of the Body; and so by the continuity of them, the same exultation is successively propagated into other spirits, and then into others, till in a short time it passes through the whole substance of the sensitive Soul; in so much as not onely the Brain, but the Heart being refreshed with a fuller influx of Spirits that do as it were leap for joy, perform their several functions and offices much more vegete and chearfully. To this end (if you take care not to put the blood into too violent a motion) the Waters commonly called Cordials, do conduce, being distilled with Wine, or Vinous spirits, and with Spices; as likewise Preparations made with Musk and Ambergris. So also Aromatick Powders mixed with them. Moreover to this place belong Magisteries and Tinctures of Coral and Pearl, together with Elixirs, and a great many more of the same sort, that have a grateful taste, or smell. Hence also all sweet smelling things, and things that are pleasant to the sight, are numbered among Cordials, in that they refresh the animal spirits: for whatsoever kindly affects and delights the spirits that rule in any organ of sense, immediately raise and enlarge the whole Soul. In the mean time other Cordials of this rank seem first to work upon the Brain, without any great disturbance to the spirits that are planted in the entrance of the body, yea without scarce so much as making the first passages and the mass of blood in any manner sensible of their presence. Of which sort are some of those Medicins that are called Cephalicks; which though they are not so grateful to the palate or stomach, and scarce put the blood upon a fermentation, or into any violent motion; yet they clear the Brain, and sharpen and corroborate the animal Spirits which are the Inhabitants of it. Of this nature seem to be Sage, Betony, Rosemary, Vervene, and many other things.

2. Some other Medicins and kinds of Administrations (which may very well be reckoned among Cordials) work after a manner very different, and do a man good upon a quite contrary reason; that is, they do not kindly treat the animal spirits, and make them expand themselves equally, but they rather provoke them, and force them to run out extravagantly, and throw themselves to and fro; and that upon this score, to wit, that whereas before they were out of order, and being dispersed unequally, did flow in some places thicker and in others thinner, and consequently intermitted some part of their functions, and especially within the Brain or Heart, or performed them very irregularly, at that time the best remedy is to disturb and put them into a greater commotion by an ungrateful Medicin: for by that means they, (as if they were roused up by lashing, or being whipt, forsake their former disorders, and return of their own accord into their regular motions. For so it is usual in Faintings, Swoonings, oppression of the Heart, or Convulsions, yea in almost all other failuers, languishments, or irregularities, to give the Parties concerned either Spirit of Harts horn, Soot, Sal Armoniack, Tincture of Castor, or Asa Fœtida, with other liquors; to hold these things and the like, as especially volatile Salts, and chymical Oils that will burn; and in sudden faintings of the Soul, it may be convenient to sprinkle cold water in the Parties face, to pluck him by the nose, to shake him violently, and sometimes to hit him a cuff on the ear. Such Administrations as these give the Patient ease, in as much as they rouse the animal Spirits when they are oppressed or distracted, or doing ought that is foreign to their proper office, and command them when they are thereby expanded, and as it were set in Battalia to return to their several former duties. But whereas some People think that help proceeds from this, that the Blood

Phar. Rat.
Part I.

They are of two kinds.

1. Such as are smooth, and gentle to the spirits.
How they work upon the Bowels or Senses.

Or lastly on the Brain.

2. Or these Cordials are rough and provocative.

Which reduce the spirits to order, by, as it were lashing of them.

being

Phar. Rat.
Part I.

being hindered somewhere in its course, and especially when it stagnates in the heart, begets the aforesaid maladies, and is by those Remedies and manners of Administrations restored to its proper motion; I say, that the cause and cure of all those indispositions, depends but secondarily and not immediately upon the Blood, but that originally not onely the stagnation of the blood proceeds from the hearts animal motions being hindered, but also that the impediments of the former, are not to be removed but by the restitution of the latter. Having now recounted to you the several sorts of Medicins that are commonly taken for Cordials, and the ways and reasons of their operating upon the Blood or Spirits, or upon both together, which (I suppose) I have rightly laid down, I must in the next place subjoin some select Forms or Receipts of them, appropriated to the several ends of Physick aforesaid.

CHAP. II.

The several Sorts and Receipts of Cordials.

Such Cordials
as increase the
heat of the
blood.

Since the Medicins that are commonly taken for Cordials have been distinguished into two kinds, to wit, one sort, that chiefly and more immediately work upon the Blood, and others that do the same upon the animal Spirits; in the first rank of them that are designed for regulating the heat of the Blood, I have placed such as force the liquor thereof, when it is too cold, or slow in its motion, to run higher, and by increasing or exalting the sulphureous particles to a greater quantity and degree, make it burn, as it were, and flame, such as are generous Wines, hot Distilled-compound Waters, Spirit and Tincture of Saffron, Elixir Vitæ of Quercetan, Tincture of Salt of Tartar, of Steel, and other things that are filled chiefly with Spirit and Sulphur in great quantity; of which People may take sometimes one sort, and sometimes another, even as the Patient pleases. Whenever a languishment and fainting of the Spirits, with great oppression of the Heart afflicts a man, by reason that the Blood is too much inflamed, and consequently is excessively crowded, and almost stagnates in the Heart, in this case Aqua Mirabilis, Cinamon, Clove and Wormwood Water compound. and likewise such as is distilled from Orange Peel with Wine, is very good; to which sometimes you may add a Dose of some Spirit, Elixir, or Tincture.

A notable abuse
of these Medi-
cins.

But here you must use great care and caution, lest you indulge your self too often to these kinds of Cordials. For I have known a great many men and women of good fashion, who by the too frequent use of them, have contracted such an ill habit, that they have been forced several times in a day to drink a small draught or a dram either of generous Wine, some Spirits or strong Waters; and then daily to increase, and often to repeat the Doses of the same liquors (for Nature having been used a little while to extraordinaries, doth not continue long satisfied with the same quantity) in so much that at last their stomach can endure or digest nothing of a moderate nature, but still desires things that are stronger and hotter. But their other entrails, and especially their Liver are so dried and roasted with it, that there is a diminution in their stock of Blood which is depraved in its temper also, and a distempered ill habit of body, or shortness of Life hath been the consequence of it.

Divers and sundry are the occasions upon which many People are induced to this ill habit of sipping Cordial Liquors. For besides sudden languishments, proceeding perchance from great sorrow, hard labour, excessive sweatings, or acute pains; if at any time such food as is disagreeable, creates a disturbance or nausea in the stomach, or that through a convulsive indisposition, a man seems to be in danger of swooning, or having his senses taken from him (and for many other reasons) it is usual for the Party to drink Vinous Spirits, or Aqua Vitæ [i.e. Water of Life] though it is improperly so called. And then after those sorts of Cordials having been for some time taken, begin to be agreeable and delightful, the mass of Blood being somewhat more largely expanded and put into a greater heat, causes the substance of the whole Soul to be extended and excited into a kind of joy and triumph; which when it sinks again, the Soul being mindful of that complacency which it received, and not content with its present state or condition, longs for the same again, and immediately covets once more to take the like pleasure. Wherefore upon every disorder of the body or mind, as soon as the spirits begin a little to faint, forthwith, for the raising of them, a draught of Cordial must be had, and if it be at hand, is certainly

swallowed; and so through the frequent and useles spreading or hoisting of the Souls Sails, the Fabrick of the Body, like that of a Ship, is weakened. Nor doth this evil custom prevail upon Gluttons and Drunkards onely, but sometimes Learned men, and very pretty ingenious women, to improve their fanſie, and put themselves in a chearful humour, do, by frequent ſipping of Spirits and hot Waters, impair and oftentimes totally destroy their own health. I ſhall not need to add in this place the common and vulgar Receipts of this kind of Cordials; it ſeems ſufficient that I have hinted to you the abuſes of them.

In the ſecond Claſs of Cordials I placed ſuch as do ſomewhat allay the exceſſive efferveſcence of the blood, and do a little reſtrain and temper the immoderate heat thereof, as Diſtilled Waters, acid and nitrous Medicins, &c.

Phar. Rat.
Part I.

2. Such as allay the exceſſive heat of the Blood.

Take of Water of Wood Sorrel, a whole Citron, and Strawberries, each \mathfrak{z} iv. of Syrup of the Juice of Citron \mathfrak{z} j. of Pearl pulverized \mathfrak{z} j. make a Julap. The Doſe is \mathfrak{z} ij. thrice or four times a day.

Julaps.

Take of Water of Sweet Apples, and of Raſpberries, each \mathfrak{z} vj. of Syrup of Violets \mathfrak{z} j. Spirit of Vitriol xij. drops, and make a Julap.

Take of Spring Water a pint and an half, of Limon juice \mathfrak{z} ij. of Sugar \mathfrak{z} j. β . make a Portion, of which you may take, when you pleaſe \mathfrak{z} iij.

Take of Graſs Roots \mathfrak{z} iij. of Candied Ringo \mathfrak{z} vj. two Apples ſliced (or of Corins \mathfrak{z} ij. of the ſhavings of Ivory and Harts horn, each \mathfrak{z} ij. of the Leaves of Wood Sorrel one handful; boyl them in Spring water, three pints to two. To the ſtraining thereof, when it is clarified add of Sal Prunella \mathfrak{z} j. β . of Syrup of Violets \mathfrak{z} j. β . make an Apozeme; of which the Doſe is \mathfrak{z} iij. or iv. thrice a day.

An Apozeme

Take of Conſerve of Red Roſes vitriolated \mathfrak{z} iv. of Sprint water ij. pints, diſſolve it cloſe and hot, and then ſtrain it. The Doſe is \mathfrak{z} iij. when you pleaſe.

Take of the Conſerve of Barberries, and of the rob of Raſpberries, each \mathfrak{z} j. β . of Pearl prepared \mathfrak{z} β . of the Confection of Facinth \mathfrak{z} j. of Syrup of Citron juice a convenient quantity. Make a Confection, of which the Doſe is \mathfrak{z} β . thrice a day.

A Confection.

The third ſort of Cordials affords us ſuch kind of Medicins, as being deſigned againſt the diſorders of the blood when it is very hot, do unlock and open the conſtitution of it when it is ſtrict and cloſe, in order to the ſeparating and carrying off of its recrements or dreggy parts. Now as theſe are chiefly and almoſt onely ſaline, ſo alſo, according to the manifold ſtate of thoſe ſaline particles of which they conſiſt, they are of ſeveral ſorts; though for the moſt part the ground or baſis of them is either a volatile or alchalized, or acid, fixed or nitrous Salt. Of each of theſe kinds I will give you ſome Receipts.

3. Cordials that open the conſtitution of the Blood whileſt it boyls up and is too cloſe.

In the firſt place Cordials that are impregnated with volatile Salt, are uſually given not onely in Fevers with reſpect to the Blood, but alſo in fainting Fits and ſudden languishings in reſpect to the animal ſpirits, and that with ſucceſs according to the Preſcriptions following.

1. Of that ſort whose ground is a volatile Salt.

Take of Spirit of Harts horn xv. or xx. drops, of Treacle water \mathfrak{z} ij. and give it in a ſpoon, drinking thereupon a ſmall draught of proper liquor. In the ſame manner you muſt give Spirit of Blood, of Dead mens Skull, Soot, or Spirit of Sal Armoniack compounded.

Spirits.

Take of Salt of Vipers \mathfrak{z} j. of Chryſtal Mineral \mathfrak{z} ij. of Powder of Claws compound. \mathfrak{z} j. β . mingle them and make a Powder, of which the Doſe is \mathfrak{z} β . to \mathfrak{z} ij. in a ſpoonful of Cordial Julap, drinking upon it a ſmall draught of the ſame.

Powders.

Take of the Flower of Sal Armoniack \mathfrak{z} β . of Bezoar Mineral \mathfrak{z} j. make a Powder and give it in a ſpoonful of proper liquor.

Secondly, Thoſe are looked upon by the Vulgar to be the beſt Cordials that are, whose ground is an Alchalized or a petrifying Salt; as firſt of all, Eaſtern Bezoar, Pearl, Coral, and other Powders of Shells and Stones.

2. Thoſe whose ground is an Alkali Salt.

Take

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Take of Gascoign Powder, or of Claws compounded $\mathfrak{z}\text{ij}$. to 3β . and give it in a spoonful of Cordial Julap, drinking upon it of the same liquor $\mathfrak{z}\text{ij}$.

Take of Eastern Bezoar gr.vj. to xx. and give it the same way.

Take of the Powder of Claws and Eyes of Crabs, each $\mathfrak{z}\text{j}$. of Pearl and Coral, both prepared, each $\mathfrak{z}\text{iv}$. of both sorts of Bezoar, each 3β . of the best Bole Armeniack, of Aurum Diaphoreticum, each $\mathfrak{z}\text{ij}$. of Bezoar Mineral 3j . mingle it and make a Cordial Powder. The Dose is $\mathfrak{z}\text{j}$. to $\mathfrak{z}\text{ij}$. or 3j . in a convenient vehicle.

Which are most proper in Pleurifies.

In Pleurifies the following preparations are looked upon as the most proper Cordials, in as much as by destroying the predominancies of the acid Salt they take off, or prevent the coagulations and extravasations of the Blood.

Take of the Powder of Boars Tusk 3β . to 3j . of Chrystal Mineral $\mathfrak{z}\text{j}$. of Powder of the Flower of Rhead Poppy $\mathfrak{z}\beta$. make a Powder to be taken in any sort of Liquor. In the same manner you may give Powder of Crabs Eyes and of the jaw of the Pike Fish.

3. Nitrous Cordials.

3. To this place belong also Preparations of Nitre, which are often given with success in Fevers, according to the Receipts following.

Take of Chrystal Mineral $\mathfrak{z}\text{j}$. of the volatile Salt of Harts horn from gr. iij. to vj. mingle them and make a Powder; which you may give in a spoonful of Cordial Julap.

Take of Chrystal Mineral, and Antimonium Diaphoreticum; or Sweat-causing Antimony each $\mathfrak{z}\text{j}$. of Bezoar Powder $\mathfrak{z}\beta$. make a Powder, and give it the same way.

4. Cordials whose ground is an acid Salt.

4. Medicins whose basis is a fluid or fowerish Sal, is given in Fevers to open or loosen the constitution of the Blood, according to the Forms following.

Take of Spirit of Vitriol drops, from iv. to vj. of Carduus Water 3ij . of Treacle Water 3ij . of Syrup of Citron juice 3ij . of Pearl $\mathfrak{z}\beta$. make a draught, to be taken twice or thrice a day. After the same manner take Spirit of Salt or Nitre. To the same end you may take Cherbet made of Limons dissolved in Spring Water, and likewise that divine Drink, called Potus divinus Palmarii.

Take of the Powder of Harts horn calcined, or Antimony Diaphoretick 3ij . of spirit of Vitriol or of Salt 3j . pound them in a Mortar of Glass and dry them. The Dose is $\mathfrak{z}\text{j}$. to 3β . in a spoonful of Cordial Julap.

Such as have fixed Salt in them.

5. The fixed or lixivial Salts of Herbs are oftentimes ingredients in the Compositions of Antidotes. And so likewise Medicins whose Bases or Grounds they are, in as much as they are reckoned great enemies to Fevers, ought also to be numbered among Cordials. For example take I propose to you that common Medicin;

Take of the Salt of Wormwood $\mathfrak{z}\text{j}$. of Carduus water 3ij . of spirit of Vitriol or Oil of Sulphur $\mathfrak{z}\text{j}$. of Syrup of Violets 3ij . make a draught to be taken two or three hours before the Fit.

Take of the Water of a whole Citron and of Wood Sorrel, each half a pound, of the Salt of Tartar 3j . β . of Limon juice 3ij . of Sugar 3β . mingle them and make a Julap, which you make use of in continued Fevers, that make no remissions. The Dose is 3ij . twice a day.

The last Class of Cordials, and truly in some respect the chiefest, is due to Antidotes, in as much as they are most vital. Of these there are so many sorts and Receipts abroad in the World, that if I should recount them every one, or but the best of them onely, this Work would grow to a vast Volume. Of such Medicins as these there are many and great Treatises extant, and therefore we ought to be somewhat more brief upon this subject. Since therefore Antidotes are either Preservatives or Curers, I will give you in the first place such select Remedies as are to be used whilest a man is yet in health against the contagion of any Pestilence or Malignity whatever, omitting in the mean while what is usually prescribed concerning the Cures and alteration

teration caused by the ambient or common Air; and then in the second place I will lay before you choice Forms of Prescriptions, which are to be used after the Contagion hath seized you. Phar. Rat. Part I.

I. Antidotes for preserving of Health.

I. Preservatives.

Take of the Conserve of the Leaves of Rue \mathfrak{z} iv. of Mithridate, and Confectio liberans, each \mathfrak{z} j. of Confection of Facinth \mathfrak{z} ij. of Salt of Wormwood \mathfrak{z} ij. β . of red Pulvis Pannonicus \mathfrak{z} β . of Bezoar Vinegar a convenient quantity. Make an Electuary. The Dose is the quantity of a Chestnut thrice a day. An Electuary.

Take of the Powder of the Roots of Virginy Creeper, of Contrayerva, choice Zedoary and Species Liberans, each \mathfrak{z} ij. of Camphire \mathfrak{z} ij. of Sugar dissolved in Bezoar Vinegar; and made into Tablets \mathfrak{z} vj. according to Art, and make the weight of each Tablet to be \mathfrak{z} β . Let the Patient eat one or two several times in a day.

Take of the Roots of Virginy Creeper \mathfrak{z} iij. and boyl them in three pints of Spring Water till half be consumed; to the straining of which add of the best Honey \mathfrak{z} ij. of Treacle of Andromachus \mathfrak{z} j. dissolve it hot and close and strain it. The Dose is two or three spoonfuls three or four times in a day. An Apozim.

Take of the Flower of Brimstone \mathfrak{z} iv. and let it melt in an earthen Pot, then put into it by spoonfuls \mathfrak{z} iv. of the Salt of Wormwood, stirring them together, till such time as the whole mass grows red. Then add of the Powder of Aloes, Myrrhe, and Olibanum, each \mathfrak{z} j. of Saffron \mathfrak{z} β . and stir them again for a quarter of an hour, till they are incorporated. Then when the mass is cold, and you have put it into a Glass Vessel, let it melt into an Oil that will shine and be as pleasant to the sight as a Ruby. The Dose is x. or xx. drops in \mathfrak{z} j. β . or \mathfrak{z} ij. of Bezoar Water twice a day. Elixiri.

Or else to the aforesaid Powder pour spirit of Wine (rectified upon the Roots of Contrayerva, or Drakes Root and Virginy Creeper) to the depth of iij. fingers, and take out a Tincture, of which the Dose is xx. or xxx. drops in a convenient vehicle.

Or take of the same Powder \mathfrak{z} β . and pour to it two pints of generous Wine, dissolve it close and hot. The Dose is a spoonful twice or thrice a day.

2. After the Party is infected and the temper is vitiated and begins to corrupt, you must use the same sort of Remedies still, though in a greater Dose, and oftener; yea, many times not onely Vinegars, but the fixed Salts of Herbs are joined with Antidotes to good purpose; in that by them the curdlings of the Bloud are dissolved, and then, when the heterogeneous particles are evaporated, and the rest forced back into their due mixture, the liquor of it at last recovers and retaineth its former condition. To these ends, though there are an innumerable company of Medicins in many Physick Books, yet I shall propose but onely one or two in this place.

2. Curatives.

Curing Antidotes.

Take of Bezoar Water \mathfrak{z} ij. β . of Bezoar Vinegar \mathfrak{z} β . of Treacle of Andromachus \mathfrak{z} j. mingle them by shaking them together in a Glass, and make a draught, which let the Party take and sweat upon it. A Draught.

Take of Gascoign Powder, Roots of Contrayerva, and Virginy Creeper, each \mathfrak{z} j. to xxv. gr. make a Powder, and give it in a spoonful of Treacle Water, drinking thereupon a small draught of the same, or of Cordial Julap. Powders.

Take of the Powder of Toads prepared, of Powder of Claws compound. each \mathfrak{z} β . and make a Powder, to be given in the same manner.

Take of Bezoar Mineral \mathfrak{z} β . of Treacle of Andromachus \mathfrak{z} j. of Camphire gr. vj. of Bezoar Vinegar as much as you think fit, and make a Bolus, to be taken the same way. A Bolus.

Take of Water of Wood Sorrel, and Dragons wort, each \mathfrak{z} iv. of Scordium compounded \mathfrak{z} iij. of Treacle and Bezoar Water, each \mathfrak{z} j. of Pearl pulverized \mathfrak{z} j. of Syrup of Clove-gilliflowers A Julap.

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gilliflowers (or made of the juice of Citron) $\frac{3}{4}$ ij. of Spirit of Vitriol xij. drops, and make a Julap. The Dose is $\frac{3}{4}$ ij. several times a day, sometimes by it self, and sometimes with other Medicins.

CHAP. III.

Of Indispositions in the Heart, and their Cures.

Indispositions
in the Heart
are,

Either a trem-
bling, or the
beating of it.

The Description
of the latter.

The cause of it
is inquired into.

NOW I have given you an account of Cordial Medicins, as they are vulgarly, though improperly called, I come next in order to treat of Indispositions in the Heart, whereby that part is really and truly afflicted, and consequently requires true Cordial Remedies or Hearts-ease. And first you must understand, that under that name of *Passio Cardiaca* [or an Indisposition in the Heart] two Distempers, somewhat different one from another, are usually signified; that is to say, a Tremour or Trembling of the Heart, and the Palpitation or Beating thereof: in both which Diseases the motion of the Heart, or the Pulse seems to be inordinate, and in some measure convulsive; but the inordinacy of the former consisteth in the quickness of its vibrations or pulsings, and of the latter in the vehemency or violence of them. I shall inquire first into the reason of this latter, and then endeavour to lay down the Theory of the other, and at length the Cure of them both.

The Palpitation of the Heart is sometimes so vehement and excessive, that it may not only be very plainly perceived by the touch, but also seen by the Eyes, yea, often heard at some distance. Besides which, it is reported by very credible Authors, that by the violent beating of the Heart, and its knocking against them, the ribs have been sometimes broken, or (in younger people) that they have been driven outward, and remained protuberant, or in a Bump.

But this motion, though it be perceptible to so many senses, yet it is not yet manifest to reason, what part is so moved, that by each pulse thereof it makes the left side of the breast to start out. I suppose all men, as well learned as unlearned, do unanimously agree, that the part so moved and strongly beaten, is the very Heart it self; but I ask them, whether the whole Body of the Heart, or onely some part of it throbs in that nature, transgressing the usual sphere of its vibration? If they say, the whole body of it is so moved, I would have them assign, whether this be performed in the Systole or Diastole, that is, the Contraction or Dilatation of it. Surely not the former; because whilst the Heart is contracted, it is plain to the very eye-sight, that the bulk of it is diminished in all its parts; nor can it be any more in its Diastole, because in that state the Heart returns onely to its natural and ordinary situation and bigness, and remains therein for some small time. Hence, seeing the Heart, according to the Laws of its own vibration, though never so much increased or heightened, cannot beat and throb so outwardly (which appears farther also, because in a fit of the Fever, when it beats most vehemently it doth not leap outward and knock against the ribs) I formerly suspected that, during this disturbance, it was in a convulsive motion, quite contrary to the ordinary pulsation, whereby the Heart, like a member that is in a convulsive agitation, is totally raised altogether and moved out of its place. But when I understood the doctrine of the Nerves more fully, I presently receded from that opinion, because it is certain that the Heart cannot be raised or carried any way whatever, by any other muscle besides its own proper moving fibres. Wherefore when I considered of this matter more seriously, at last it came into my mind, that whilst the heart is contracted, to exclude or press the blood out of its cavities, and the point as well as sides thereof fall in and are drawn nearer to each other, yet if all the blood cannot immediately at every systole or contraction be clearly thrown out and discharged, it must of necessity follow, that the roots of the vessels, being filled to the height, and very much extended, will leap up and throb with some kind of violence, and then, through the reverberation which is here made, that the whole frame of the Heart will be very much shaken.

And indeed, that this Distemper arises sometimes from such a cause, I saw it lately confirmed from an Anatomical observation. A famous and pious Divine, when he had lived a good while subject to the Palpitation of the Heart for several fits which came sometimes of themselves, and sometimes occasionally, at last began to be afflicted with

It proceeds
sometimes from
the hindrance
of the blood,
flowing into the
Arteries.

with it continually, day and night, and had a difficulty of breathing besides; and after that in a few Moneths, being as it were worn away by the constancy of so very troublesome a Distemper, he died. When his body was opened, the right side of his Heart appeared immediately swelled with congealed blood, the auricle [or ear] whereof being likewise augmented to a vast extent, contained in it a great quantity of grumous or thick gore. The reason why these things were so, appeared presently; to wit, because the Lungs being very much obstructed, and stuffed with black, extravasated, and every way stagnant blood, could not admit all that blood which was continually to be discharged out of that ventricle or cavity; whereupon, whilst the Heart, which endeavoured all that it could to make a total exclusion of it, at every systole or contraction, is drawn together inwardly at the cone or tip, and in the middle, and is diminished in its bigness, the base or bottom of it being very full, struts out by reason of the blood which is gathered there, or sticks, or is reverberated [*i.e.* beaten back] in its passage, and being more tumid [or swollen] through the bulk of the auricle, beats more strongly, and raises it self outward.

But to say the truth, it is not onely from this cause that the Palpitation of the Heart proceeds, because that Distemper is not always constant and perpetual, but for the most part wandering and uncertain, infesting the Heart by fits, and then again either of its own accord or by the use of Remedies it ceases. Moreover it often invades some persons, whose Lungs are sound enough and free from all consumptiveness.

And yet, although this Disease may arise from divers causes, yet in all of them I am of opinion that it takes the same way still in affecting the parts. For it seems to me that the heart onely beats, in as much as upon the systole or contraction thereof, whilst the cone [or point] and sides are drawn together and straitned, the base [or bottom] of it, together with the roots of the vessels, is enlarged and swells, by reason that the blood is gathered there, and sticks, or is repurcussed [*i.e.* beaten back] in some measure. Now that the course of the blood in this place is somewhat hindered or rebated, is manifest from this, that whilst the heart beats vehemently and very strongly in the side, the Artery in the Wrist most commonly pulseth very languidly and weakly, as conveying but a very small rivelet or stream of blood. Since therefore the conjunct or immediate cause and true reason of this Disease, consists altogether in a stoppage and gathering of the blood about the base or bottom of the heart and the roots of the vessels, our business is next to enquire how many ways, and by what other causes that kind of Disease is usually produced.

Upon this occasion, that we may not much blame the fleshy part of the heart, nor the proper moving fibres thereof, this defect seems chiefly and for the most part to be imputed to the blood, of the vessels joined to the heart. The reason of the former is sufficiently manifest, for as much as those who have watery blood, that is less apt to boyl up and be inflamed, as Virgins that are troubled with the Greensickness, and Men or Women that have an ill habit of body, are for the most part found to be subject to this Disease, and are almost constantly used to feel the shock of it from any extraordinary quick motion of the body. The reason of which is, because the blood, when it consists of dull and unactive particles, is not freely and nimbly thrown out of the cavities of the heart, but oftentimes stays and stagnates in them; and therefore whensoever the heart through any motion of the body is filled more plentifully with them, so that the whole quantity that is in it cannot be discharged at every systole or contraction, it labours with the greatest force imaginable, till it casts it into its own base, and the roots of the vessels, and scarce any farther; where when it is gathered together, and making some little stay, causeth the containing parts to swell, it produceth the *Passio Cardiaca* [or Indisposition of the heart] with difficulty of breathing besides.

But furthermore, this Disease of the Heart doth many times happen to some persons that have very hot blood, which is apt enough to be heated or put into a ferment. For to a great many people that are very subject to the Hypochondriack Distemper, Fits of the Mother, or other convulsive Maladies, this evil is frequent and familiar; wherefore in these cases, we may justly suspect that the Arteries joining to the heart are in the fault. By what means the obstruction of them, hindering the free flowing of the blood out of the heart, produces the palpitation thereof, the Story just now cited, doth manifestly declare: and besides that, the shutting or filling of those vessels, caused several other ways, may produce the same effect. I knew an old man that was used for many years to drink strong, old Beer, as also Wine, and oftentimes underwent the pain of the aforesaid Distemper: which person afterward dying of a mortification in his Stomach, with continual vomiting, languishment of his spirits, and other symptoms; I opened his body, and found the body or trunk of the great Ar-

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It arises also
from other causes.

This Distemper
depends oftentimes upon the
indisposition of
the Blood and
the Vessels be-
longing to the
Heart.

The reason of
the former.

2. In the other
case, either the
vessels are ob-
structed, or
convulsions.

An Example of
the former.

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Part I.

And the divers
kinds of it are
noted.

How the Palpi-
tation of the
Heart is a con-
vulsive.

To what end so
many nerves
are inserted in-
to the coats of
the Arteries.

An Artery is
endued with
moving fibres.

And is moved
like other mu-
scles, or the
heart it self.

And is often
troubled with
convulsions.

Whence the
Palpitation of
the Heart often
arises.

tery just without the heart as hard as any bone, or rather any stone, and the sides of it very much compressed, in so much that there being onely a crevice left, the blood could hardly flow forth with half the torrent that it should have done. And therefore justly ascribed the palpitation of his heart, wherewith he was frequently troubled, to this cause. But it is probable that this indisposition doth sometimes proceed from the blood that thickneth in the cavities of the heart and the vessels thereunto appertaining, and hardeneth, as it were into fleshy bits.

But besides all this, seeing the palpitation of the heart is oftentimes accompanied with other convulsive Distempers, as I just now hinted, we may likewise suspect that the cause thereof is sometimes meerly convulsive. I formerly (in my Book called *Neurologia*, [or a Treatise of the Nerves]) demonstrated from Anatomical Observations, that a vast number of Nerves and nervous fibres did embrace and encompass the trunks of the arteries in many places, and especially about the bottom of the heart; the use and actions whereof I thought were of that nature, that the different boylings, fluxes, and refluxes of the blood, yea sometimes also the stagnations of it, which are usually caused by the vehement passions of anger, fear, joy, sadness, and other indispositions, may thereby be brought to pass, so far forth as those small lines or cords of Nerves do variously streighten, compress, or it may be, sometimes quite shut these blood-carrying vessels. Moreover it is not very improbable that the fits of Palpitation in the heart do sometimes arise from those vessels being in a convulsion, and somewhat too long streightned, so that they hinder the free discharge of the blood out of the heart. Indeed I impute (and that upon good ground too) not onely this but also those other diseases of the heart to such a cause: but as to the manner of bringing it to pass, I think I ought a little to recede from that opinion. For when I had more exactly weighed the uses and actions of the Nerves, I found at last that neither they, nor their branches did either draw or streighten the parts one jot, but that this whole affair was performed altogether by the fleshy fibres, and that the nerves did onely convey fresh supplies of spirits and instincts or inclinations to the performing of new motions, into these moving parts: in the same manner as they do to the membranous fibres, in order to the perception which is in them.

Whilst therefore I seriously inquired for what uses so many nerves as are disseminated through the coats of the vessels, should serve; at last I found that those Arteries contract and extend themselves by their own strength, as well as other parts about the heart, and that for the performing of their motion both natural and forced, not onely supplies of spirits, but the causes of their inclinations to move, were brought into them by those nerves. For it is plain from Anatomical Observations, that the middlemost coat of every Artery, is manifestly muscular, and consists throughout of fleshy fibres, such as those are in the Stomach, Guts, and some other entrals. Which annular fibres, encompassing the body or trunk of the Artery on every side, as it were, with a thick row of small hairs, have, without question, their Systole and Diastole, or Contractions and Extensions, as much as the heart it self. Wherefore it is altogether necessary, that whilst the fibres of the Heart, and then these of the Arteries are successively and regularly contracted, the blood be rapidly driven from one part into another. Wherefore it is not for nothing that some Physicians have attributed to the Arteries also a pulsifick faculty, or power to cause a pulse: for it is very improbable that the circulation of the blood is performed by the mere impulse of the heart, as it were from a Syringe. How much more likely is it that an artery, being in some measure contracted after every wave of blood, doth through its whole passage, push it still onward through lesser rivelets, and more contracted spaces? According to this ordinary way of driving the blood about in equal proportion, the Arteries seem to have their constant turns of Systole and Diastole, or Contractions and Dilatations. Which though they are very swift and quicker than the twinkling of ones eye, yet they are performed successively through all the parts of the arterial Pipe or Conduit. But seeing that we observe the equal course of the blood to be diversly interrupted and disturbed according to the force of such and such indispositions, it must necessarily follow, that it proceeds from this alone, that the Arteries (by reason of the instinct which is conveyed into the moving fibres through the nerves) being suddenly in several places streightned, do either stop and restrain the current of the blood, or push it forward more impetuously. In fear, sudden grief, shame, love, and other Passions, which cause a great consternation or confusion in the mind, it is probable that the trunk of the Aorta is so contracted and streightned by those fibres which are suddenly and long compressed, that the blood gushes out of the cavity of the heart with great difficulty, and that but in small portions. Wherefore from the gathering and stagnation of it therein, great disturbance and oppression doth presently proceed; and then after that, if upon this stoppage of the

the blood there succeed a strong and vehement pulsation of the heart to throw it out, it will of necessity follow, that by reason of the blood which at every systole or contraction is cast out into the basis of the heart, and there repelled, those parts must be very much distended, and consequently must cause the palpitation of the heart. *Phar. Rat. Part I.*

But as vehement passions of the Mind produce this distemper in most people, so Hypochondriacal persons, and such as are inclined to convulsions, feel the torment of it upon every light occasion, yea sometimes without any manifest cause. For those in whom the Bowel nerves, and those of the heart, are usually beset with morbidick [or diseased matter] in so much that such matter being moved through fulness or irritation, puts the spirits that inhabit those parts and the parts adjacent very commonly into convulsions and inordinate contractions, it frequently happens, by reason that the nerves which are inserted into the roots of the Heart-arteries, are affected by such a cause, that the fibres also of these vessels being put into convulsions and contracted, as I have told you, produce the palpitation of the heart. How the nerves of the heart are irritated or disturbed by a near or remote cause, or by the morbidick matter that settles either in the head, near the original of the nerves, or in the parts about the heart or Hypochondria, and are put in several kinds of convulsions, I have elsewhere shewn; from whence the causes of the palpitation thereof, as often as it is convulsive, may be deduced. *Why this Disease is familiar to hypochondriacal people.*

As to the Cure of this Disease, seeing the Causes of it are many and various, the Cure thereof ought likewise to be performed different ways. For as to what some people say, that those kinds of Remedies which being vulgarly called Cordials, are said to refresh the heart, and to afford strength to it when it is out of order, are good in all these cases, is not onely contrary to reason, but common experience also. Since therefore I have formerly declared, that the palpitation of the heart proceedeth either from the ill temper of the blood, or indisposition of the arteries belonging thereunto, and that I have touched upon both the several ways of their affecting the parts, it now remains, that I accommodate or apply to every sort of this Distemper a proper Method of Physick, together with select Receipts of Medicins. *The Cure of it.*

1. First therefore, if at any time this Disease proceeds from the illness of the blood, the way to cure it will be chiefly to exalt or raise the blood, which is too watery, and unapt to be heated, or put into a ferment, to a better temper, and to relieve or augment the active principles of it, which are depressed or weakened; to which end spirituous and salt Medicins of all sorts, as also sulphureous and especially chalybeate ones, do conduce. Besides which you may refer to this place such remedies as are usually prescribed in the Greensickness, Leucophlegmatia [or a Dropsie, caused by abundance of white phlegm] and the colder sort of Scurvey. *By what means it is performed when the blood is in fault.*

Take of Conserve of Roman Wormwood, of the yellow rind of Oranges and Limons, each \mathfrak{z} ij. of Winters Bark pulverized \mathfrak{z} ij. of Species Diacurcumæ \mathfrak{z} j. of Steel prepared with Sulphur \mathfrak{z} iij. of Salt of Wormwood \mathfrak{z} j. β . with a convenient quantity of Syrup of Citron rind, and make an Electuary. The Dose is the quantity of a Nutmeg in the morning and at 5 of the Clock in the afternoon, drinking thereupon of the following Julap \mathfrak{z} iij. and walk about. *An Electuary.*

Take of the Water of Cuckow-pintle Leaves one pint, and of Penny-royal, and Hyssop, each \mathfrak{z} iv. of Water of Worms and of Snails, and of Aqua Mirabilis, each \mathfrak{z} j. of Sugar \mathfrak{z} i. mingle them and make a Julap. *A Julap.*

Take of the Tincture of Antimony \mathfrak{z} j. The Dose is from 20 to 25 drops twice a day, with the same Julap. *A Tincture.*

To this place also may be referred the Tincture or Syrup of Steel, as likewise the Elixir Proprietatis, with many other Medicins.

Secondly, The palpitation of the Heart ariseth more frequent and much stronger from the Arteries thereunto belonging, which are indisposed; and then their fault is either an Obstruction or Convulsiveness. *How this Distemper, when it ariseth from an obstruction, ought to be dealt withal.*

The former of these two Distempers is most commonly continual, and many times incurable; but especially if it be caused by a consumption in the Lungs, or from the roots of the Arteries being half filled up or compressed by a small bony swelling or excrescence. Which sort of causes, if at any time they happen to be such, and can be perfectly extinguished, it would be in vain to endeavour the removal of them; but

Phar. Rat. but rather take care onely that ease be given to the Patient by sleepy Medicins, and his life preserved, though in misery, a little longer.

Part I.

But it is not improbable (as I just now hinted) that the Arteries may be for a great part filled up sometimes by a polypous or corrupt matter that settles there, and is usually generated within the cavity of the heart, and consequently the free and total discharge of the blood out of it hindered. But as I think the way to distinguish when it is so, is very difficult, so the cure of it is no less rare and unusual. When you have any suspicion of such a thing, saline Medicins seem to be of most use, and among them, such chiefly as are impregnated with volatile or acid Salt: but you must not use them both together, but sometime before try the latter, and then (if they do not do the business) apply the former.

Medicins made with volatile Salt.

Take of the Spirit of Sal Armoniack compounded, viz. distilled with Woodlice, or other things that are good against an Asthma [a Disease in the Lungs that stops the breath] 3 iij. The Dose is from 15 to 20 Drops thrice a day, with a Julap or Distilled Water that is proper. In the same manner you may try Spirit of Harts horn, Soot, Blood, and Skulls.

Such as have acid Salt for their ground or basis.

Take of Sea Salt or Vitriol distilled, and often cobobated or redistilled with spirit of Wine impregnated with Pneumonick herbs [or herbs good for the Lungs] 3 iij. The Dose is from 15 to 20 drops the same way. For these uses Spirit of Tartar, of Guaiacum, and of Box, are usually prepared.

The Cure of this Disease when it arises from convulsions in the Arteries.

3. The Palpitation of the Heart is oftentimes a convulsive Indisposition, and is usually produced from the like cause and manner of illness as other hypochondriacal or asthmatical maladies are. The Cure whereof ought also to be attempted by Remedies that are good against Convulsions: but you must take care to make choice of them with some distinction, according as the Disease happens, either in an hot or a cold temperament of body.

In respect to the former, the following Medicins may be taken.

A Spirit.

Take of Spirit of Amber Armoniack 3 iij. The Dose is from 15 to 20 drops twice a day, in the Julap, or distilled Water that is appropriated to it. In the same manner you may give Tincture of Tartar, Steel, or Antimony, at several times.

Of the trembling of the Heart.

How the trembling of the Heart differs from the Palpitation of it.

The trembling of the Heart (which goes also under the name of the *Passio Cardiaca* [or Indisposition of the Heart] is a distinct, nay a quite different Disease from the Palpitation of it. For in that, the fleshy or moving fibres of the heart it self onely seem to be affected, nor doth the cause of the Disease lie in the Blood or the Arteries belonging to the Heart, as in this other Malady [of the Palpitation] it doth.

The Description of it.

The trembling of the heart may be very well described to be a Convulsive twinging, or rather trepidation of the flesh thereof; whereby the motive fibres make very quick, but abrupt, and as it were half turns of their systoles and diastoles, or contractions and dilatations, with great speed, but contracted onely half way; so that the Blood cannot be brought into the cavities of the heart, or carried out of them, but by exceeding small portions.

The reason of this depends upon the doctrine of the Muscles.

Seeing this Disease is a convulsive motion of a certain muscle, to wit, the Heart; for the more full understanding of it we should refer to this place all that I have elsewhere discoursed concerning the Motion of Muscles, and likewise what I have said of Convulsive Distempers. Nor will I be tedious in repetitions; onely observe in one word, that every muscle consists of two tendons and a fleshy belly; and that the contraction thereof is performed by the animal spirits leaping forth from the fibres of both those tendons into the fleshy ones, which whilst they blow up, or inflate, and tumifie [or make to swell] they thereby shorten and contract them; but when that motion is over, the spirits return into the tendons, and the fleshy fibres are relaxed, or slackened again.

The sum of it.

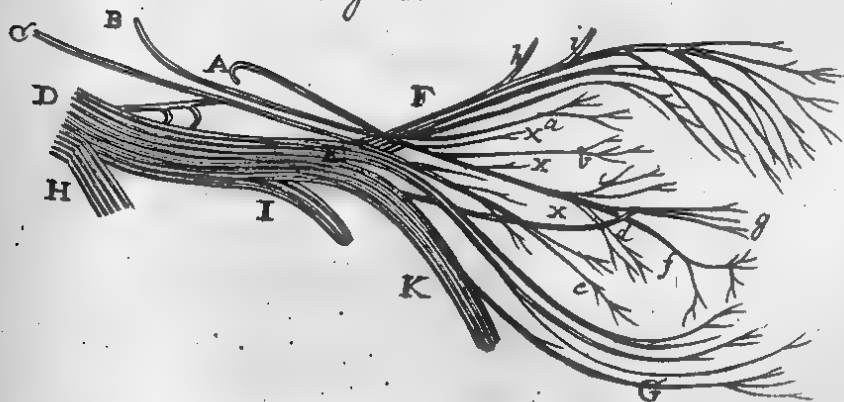
Since the moving faculty is twofold, to wit, either voluntary, or meerly natural, in the former I observe that the spirits are called forth out of the tendons into the fleshy fibres by the command of the Appetite, and that they remain within them in action, till by its order they are dismissed; and then that they return into the tendons and are at quiet, till they are again commanded forth; so that the times of their motion and

Fig. I.

KK. p. 118



Fig. II.



and rest are unequal, uncertain, and variously determined, according to our pleasure. *Phar. Rat. Part I.*

In the mere natural way it is quite otherwise; for the animal Spirits are discharged out of the tendons into the fleshy parts with a perpetual or constant reciprocation [or motion to and fro] and having made a short contraction in them, flow back immediately out of these into those, and so on the contrary: after which manner the heart it self, the Arteries and Organs [or instruments] of respiration, yea the fleshy fibres of the Stomach and the Guts also, (unless their objects are otherwise determined) are agitated [or moved] by perpetual Systoles and Diastoles [or Contractions and Dilatations].

According to these ordinary courses are the actions of both those moving faculties performed. Which notwithstanding, according as the animal Spirits, that are executors of such motions, stand variously affected, are usually perverted or disturbed in several manners. For it is sufficiently evident, that the instinct of every contractive motion, which is to be performed by any muscle, is conveyed by the nerves from the Brain in general, or the Cerebellum [the hinder part of the Brain] according to the command of the appetite, or the necessity of nature; that is to say, the animal Spirits that are within the passages of the nerves, being excited according to the impression made upon them from the head, and moved in their whole train, do presently rouse up the others that inhabit in the tendons, and put them into the like motion; after the same manner almost, as if a man should set fire to several heaps of Gunpowder at a distance with a lighted match. As long therefore as those spirits, both at their original, to wit, within the Brain, and also in their conveyances, to wit, in the passages of the nerves, as likewise at the end, where they are planted within the tendons, are regular and orderly; the first of them form the instinct of [or inclination to] each motion; the second convey it, and the third at last put it in execution: but if the spirits that are designed for motion, are preternaturally [or unusually] affected in any part, and forced into disorders, immediately thereupon convulsive motions are raised in the respective members or muscles. After what manner through any morbid cause, Convulsions happen near the original of the nerves in the head; and in what manner also, through its being settled within the nervous passages, they are caused elsewhere, I have at large declared in another place; that is to say, in as much as the spirits that flow within the nerves being irritated or disturbed by some preternatural and vehement cause (and pierced as it were, or stung by a Breeze or Gadfly, whilst they run swiftly into these or those parts) carry unnatural and false signals of such motions, as are to be performed, it must of necessity follow, that there will happen contractions, or violent and convulsive distentions in some or others of the muscles, or membranes. I have clearly laid down the several sorts and true natures of these kinds of Indispositions in my Book called *Spasmologia* [or a Treatise of Convulsions]; but yet, having there permitted something that makes for our present purpose, I do here further observe, that there are other sorts of Convulsions, which without any present or great indisposition of the Brain or Nerves, arise chiefly and almost onely from the faultiness of the animal spirits that are inhabitants in the very tendons themselves.

The convulsive motions of Muscles are explained,

And distinguished.

Some private convulsions belonging to the Muscles onely.

Of this singular, and as it were private Indisposition, there are two sorts that offer themselves to our observation. The one is commonly known, wherein the spirits oftentimes without any command [from the appetite] gush out of the tendons, and blowing up the fleshy fibres strongly, and with some disturbance, do not quickly or easily retire. The other, though less notable, yet is frequently seen; that is to say, that in which the spirits of the muscles cannot remain long either within the tendons or within the flesh, but being excessively disquieted, make excursions and incursions to and fro out of the one into the others, and contrariwise, very frequently, but weakly still, and in disorder, even against the inclination of the Appetite, or of Nature. Concerning these Convulsive Indispositions (because as yet they remain almost untouched by most other Physicians, and the knowledge of them conduces very much to the explication of the Nature and Causes of the *Passio Cardiaca* [or Indisposition of the Heart], I think it worth while here to subjoin some few words, though it be foreign to my design, and as it were, a digression [i.e. going out of the way].

Two sorts of them.

The first Indisposition of these two, which in Greek is properly called *Tétanos* (and is usually both in ours and the French Tongue, known by the name of the *Cramp*) arises most commonly from this, that the animal Spirits without any bidding, as it were, flow out of the tendons (one or both together) of their own accord into the belly of the muscle; whence they do not commonly with any speed return, but staying a long time within the flesh, blow up [or inflate] them very excessively, and make them extraordinary con-

con-

Phar. Rat.

Part I.

contractive; and then seeing the other muscles do not either give way to these, or conspire with them in their contraction, the part grows stiff, strained with the greatest pain that can be. The cause of this is a certain heterogeneous or strange flatulent kind of matter, which descending through the nervous passages, together with the juice thereof, into the muscles, and sticking to the spirits, makes them elastical or springy, and at the same time obstinate too; in so much that they cannot be contained within the tendinous fibres, but desiring greater space to move, run out into the flesh, and remain there till the tumour or swelling of them is allayed.

The latter is a
kind of Trepidation in a
Muscle.

2. To that latter sort of Convulsive Motion properly belongs the Passion or Trembling of the Heart. And to this place you may refer that Indisposition which is vulgarly known, and familiar to a great many People; to wit, that sometimes they feel very frequent and equal shootings or trepidations of any muscle, suppose in the Lip, Cheek, Eyes, and other members: which when they have lasted perchance for two or three minutes, cease of themselves. It is not long ago since I was advised with, by Letters sent hither out of France, in the case of a certain person of quality, whose Muscles were all almost perpetually throughout his whole body in such a trembling condition; in so much that the outward part of his flesh leaped up, as it were, on every side, and did exactly imitate the vibrations or pulses of the heart.

The true reason
of it.

The true nature of these Indispositions as well as of the Trembling in the heart, seemeth to consist in this, that the animal Spirits belonging to any muscle, being disturbed, and as it were, set on gadding, gush forth continually out of the tendons into the flesh, and then return, perpetually repeating their excursions and incursions to and fro; in the mean time when they go forth with onely small forces, so as not fully to blow up the fibres, and that they stay but a very small while in them, they cause endeavours to move, which though they are extraordinary frequent, yet they are but weak and very little; in so much that the members and limbs are not moved from place to place, but the muscles being so perpetually agitated, and the heart, whilest the trembling thereof remains, though it be swiftly concussed or shaken, yet can scarcely or not at all drive about the blood; as plainly appears from the smalness, and as it were, trembling of the Pulse, and a faintness in all the parts.

Their Causes.

As to the causes of these Distempers, that is to say, the conjunct or immediate and the original causes from whence the spirits in the muscles grow so unsteady, or gain that desultory [or unconstant] quality, it seems, that some heterogeneous and elastical matter that is transmitted through the Brain and the nervous passages, is at last discharged into the muscles and their tendinous extremities; where, growing or sticking presently to the spirits, it irritates them exceedingly, and sets them as it were a madding, so that they cannot rest in any one place, but run to and fro continually, and in the mean time either omit, or do not strenuously perform their due offices.

It is not right-
ly imputed to
the Spleen.

The cause of the Trembling in the Heart, is commonly imputed to the Spleen; for it is commonly supposed, that from this the Entrails being obstructed, or otherwise out of order, ill vapours are raised to the Heart; which smiting of it, compel it to shake and tremble in that manner, yea make it stiff, as it were, with cold. The belief, or at least the probability of this opinion is built upon this, that hypochondriacal (or which is almost the same thing, splenetick) persons are very subject to this Disease of the Heart. What and how great the influence of the Spleen is upon the Heart, I have formerly and largely declared. From which, and partly from what I have just now said, it sufficiently appears, that that opinion, though never so commonly received, concerning the Hearts being affected or disturbed by vapours, is a trifling one, and altogether erroneous. But whereas those that are taken commonly for splenetick and likewise hysterical people, are so commonly troubled with the trembling of the Heart, the cause is from that great affinity and intimate communication which there is between the bowel nerves and those of the Heart; in so much that not onely the disturbance of one part makes the other sympathize or consent with it, but if at any time the convulsive matter gets into the branches of the nerves that belong to the Spleen or Bowels of the lowest Belly, it seldom happens but that it seizes also upon the nerves belonging to the Heart.

The Heart is
not disturbed by
Vapours.

The Cure.

As to the way of curing this Trembling in the Heart, since it is a Distemper meerly convulsive, for that reason, not cordial Remedies, but rather cephalick ones (or such as affect the head and nerves) are most proper; which notwithstanding ought to be either hotter or colder, or sometimes of one and sometimes of another nature, according to the temper and constitution of the Patient. To make short of the matter, seeing three sorts of Remedies are usually most beneficial in this Distemper, to wit, such as are made of Shells, of Steel, or impregnated with volatile Salt, I will lay down in this place some Receipts, and the ways to use each of them.

First

First therefore when you have made provision by such things as purge the whole body, and made a choice of such Physick as seems of most use to you, prescribe in manner following. Phar. Rat: Part I.

Take of Coral prepared and of Pearl, each 3ij. of both sorts of Bezoar, each 3℥ of the whitest Amber 9ij. of Ambergrise 9j. make a Powder. The Dose is 3℥. twice or thrice a day, with Distilled Water, or the Julap appropriated for it. Powders.

Take of Powder of Claws compounded 3ij. of Powder of the roots of the male Peony, and of dead mans Skull prepared, each 3j. of the Flowers of the male Peony and of Lilly of the Valley, each 3℥. make a Powder, to be taken the same way.

Take of Ivory and red Coral pulverized, each 3ij. of Species Diambra 3j. of the whitest Sugar dissolved in a convenient quantity of Orange-flower Water, and baked into Tablets 3vij. Make, according to Art, the weight of each Tablet 3℥. and let the Party eat one or two several times in a day, when he will. Tablets.

Take of the Conserve of Flowers of Lilly of the Valley 3vj. of Powder of Coral prepared, of Pearl, Ivory, and Crabs eyes, each 3j. ℥. of Vitriol of Mars 3j. a convenient quantity of Syrup of Coral, and make an Electuary. The Dose is from 3j. to 3ij. twice a day, drinking thereupon a draught of the following Julap. An Electuary.

Take of Orange-flower Water, and of a whole Citron, each 3vj. of the rinds of Oranges, distilled with Wine 3ij. of Sugar 3℥. and make a Julap. A Julap.

Take of my Syrup of Steel 3vj. The Dose is one spoonful in the morning, and at five of the Clock in the afternoon, with 3ij. of the prescribed Julap, without the Sugar, or with distilled Water. Syrup.

Take of the Powder of Ivory and Coral, each 3ij. ℥. of Species Diambra 3j. of Salt of Steel 3ij. of Sugar 3vij. of Ambergrise dissolved 9℥. and make the weight of each Tablet 3℥. The Dose is 3ij. or iv. twice a day. Tablets.

Take of fresh Strawberries viij. pints, the outward rinds of 12 Oranges, of the filing of new Iron 1℔ ℥. and when you have bruised them together, pour to them of white Wine viij. pints. Let them ferment in a close pot for 24. hours, and then distil them with the common instruments. A distilled wa.

Take of spirit of Harts horn, or Blood, or the like, 3ij. The Dose is 20 drops twice a day, with a convenient vehicle. A Spirit.

Take of the Flower of Sal Armoniack, and of Coral prepared, each 3ij. The Dose is 9j. twice a day. Powders.

Take of Chrystal Mineral 3ij. of Salt of Amber 3j. of Salt of Harts horn 9j. mingle them. The Dose is from xv. to xx. gr. twice a day with Distilled Water.

Of an intermitting Pulse, or such a Pulse as beats sometimes, and then leaves off.

Among the Distempers of the Heart may be reckoned also an Intermitting Pulse, and that very reasonably; because in this Malady, or at least in some sort of it, the Heart it self is put into a disorder, though in a manner somewhat different from what it is in the palpitation or trembling of it: for in these it is ill and irregular in respect of its motion, but in that it labours even in its rest: for this sometimes is twice as long, as according to its ordinary course it uses to be.

Concerning this Distemper we must first distinguish; because there are (if I am not much mistaken) too different reasons of it. For though sometimes the Pulse intermiteth, because the Heart, for that time, ceases to move; yet furthermore you may perceive by your feeling that the Pulse seems sometimes in the wrist to intermit, whilest the Heart may be felt to beat very swiftly and incessantly in the Breast; as is evident in the trembling of it. The reason of which I take to be, because when that Distemper of the Heart comes upon it, there is but a very small portion of the Blood is thrown forth into the Aorta at every Systole or Contraction. Wherefore when that is emptied and grows lank, as wanting its due measure which it should drive for. Two sorts of an intermitting Pulse. The first, which happens by default of the Aorta.

Phar. Rat.
Part I.

forward, lest it should trouble it self too often to no purpose, it sometimes intermits its contraction. This seems just like the disburdening, or (as the Seamen say) unlivering of a Ship; for when the Commodities in the Cargo are with difficulty and very hardly unloaded, the Porters that are to carry them away, escape some turns of going to and fro. Moreover in malignant or mortal Fevers, if the Pulse at any time be thick and weak, it likewise now and then intermits. The reason of which is, not that the heart sometimes ceases to move, (for even at that time especially it labours continually) but for as much as the blood is not poured forth in a sufficient quantity into the Aorta, that Artery wanting work enough to imploy it, is sometimes idle.

The second,
which proceeds
from the heart
it self.

But besides this, the Pulse sometimes intermits, because the contraction of the heart it self is for such a time suspended, and the pause or rest of it is twice as long as it should be; which anyman may easily perceive either in himself or any other person, by laying his hand upon his own or their Breast, yea those that are troubled with it, are very sensible in themselves, by the pain and oppression of their breast, how often the heart ceases to move. Besides, this Distemper doth not commonly invade your languishing, dying, or dangerously sick People, so much as it does those that are very hearty, and for the most part well in health: wherefore it ought not always (according to the vulgar opinion) to be taken for a Disease, or a very dangerous and fatal Symptom. Those that are subject to this Distemper are usually troubled also with a Dizziness,

But is not al-
ways an ill co-
ken.

Several sorts of
it.

Headach, or Convulsions. But this defect of the Heart is in its nature very various; for the periods of its intermissions are sometimes certain, and determined to some one beat of the Pulse (suppose) the third, fourth, fifth, or any other, sooner or later; and sometimes they are uncertain and fleeting, so that the cessation happens one while after fewer, and another time after more pulsations. The vibrations of the Artery whilest they are continued, are strong and brisk enough, and are for the most part equal; but sometimes the first beat after the intermission is the greatest, that which is next, a little lesser, and so they grow less and less insensibly, till the intermission comes again; and then afterwards, a great beat at the beginning descends, as it were, by steps into a cessation again.

I have known some People that (as far as I could perceive by my observation) had an intermitting Pulse continually, in so much that whensoever I touched the Artery, I found it so, and yet in the mean time they seemed healthful enough, and complained of no other ailment: but I have observed some others that had a Pulse, more slow than usual, and intermitting, onely when a grievous Headach or some great pain in that part was either upon them or a coming.

The cause of it.

From hence I suppose it is manifest, that the cause or true reason of the Distemper just described, depends not upon the mixture or temper of the blood, but onely upon the irregular conveyance of the animal Spirits out of the Brain into the Nerves belonging to the Heart, and thence into the tendons thereof. For we may well suppose, when those nerves are somewhat obstructed, that the animal Spirits do not come down with so full a tide or stream as they should do, into the tendons of this Muscle; wherefore when the stock of them is somewhat deficient, the motion of the heart ceases ever and anon for one beat, till the supplies of spirits being reinforced, its action may be renewed: so I have seen a Mill that was driven about with a small stream, when the Water falls sometimes and is almost exhausted, stop for a little while; and then again, when the stream rises, immediately repeat its rounds, and go again.

The way to
know, when it
is coming.

Those whose pulse, though in it self great and strong enough, is used to intermit, are not onely subject to Headachs and Dizziness, but most commonly to the Incubus or Nightmare [a Disease so called] and sometimes also to the Apoplexy. For if it happen, that the Nerves belonging to the Heart, which before hand are not open and free enough, are afterward wholly obstructed or stopped up, it follows of consequence, that the heart (which is the chief agent) being rendered immoveable, that the fabrick of an animate Body must wholly cease to move, and for that reason, to live.

The Cure of it.

Though this Distemper hath oftentimes no present inconvenience or danger in it, and therefore doth stand in need of too speedy a Cure; yet for preservations sake, and to prevent worse Distempers, some Remedies and a Method ought to be used in order to its Cure, at least it will be convenient that in all the remaining part of a mans life, he take a care to keep a regular way of Diet: and besides that, some small course of Physick, which must be constantly observed in the Autumn, is very requisit: that is to say, that as much as is possible, all the Seeds of Diseases that are sown in the Brain, or apt to be generated there, must be removed or prevented. To this end I refer you to that cautionary Method, with the Remedies against the assaults of an Apoplexy, which I have elsewhere prescribed.

The

*The Anatomical Description of an Artery.*Fibar. Rat.
Part I.

Because I have formerly told you that some Distempers, commonly taken for Indispositions of the Heart, proceed rather from the Arteries than the Hearts being affected; and that the disorders of the blood, which are usually caused upon the disturbances of mind, arise from the irregular contraction of those vessels; I therefore in this place think it suitable and worth the while to give you a brief Anatomical Description not onely of Arteries in general, but especially of those that belong more immediately to the Heart, together with their uses and offices; and that the rather, because though the Ancient Physicians have discoursed very largely upon these vessels, yet the New or Modern Doctors, attributing the whole circulation of the Blood in a manner onely to the heart, have been very little concerned about the Arteries.

First therefore, to recount to you what the Ancients have said, *Galen* in his Seventh Book of Anatomy Chap. 5. says that every Artery consists of two coats, to which (says he) we may add a third and a fourth. Again in his Third Book of Natural Faculties, Chap. 11. he saith, that Arteries have coats, as the Stomach hath, and that the inner coat hath long and oblique fibres, but the outward coat transverse ones. How and with what agreement to his words the thing appears to my observation, I shall now briefly shew you.

To perform this enterprize aright, take out a portion of the great Artery or the Aorta either of a Man or an Ox; which when you have drawn upon a stick (upon which it may be kept at full stretch) dip it several times in boyling hot water, so the tunicks or coats and fibres being somewhat contracted and more swollen, may be the better distinguished and plucked asunder; then, when you have made a separation of them with a knife, you will see four several coats. The outmost of them being thin and nervous serves for a covering to the whole vessel, and hath on its outside many nervy branches, that creep about it every way; but in the inner surface it is covered with a texture or web, as it were, of all sorts, but especially blood-vessels, resembling a Net, and very thick all over. The Arteries ascending originally from the *Vasa Coronaria*, and then on every side from the trunk of the Aorta and the branches thereof, are ramified [or branched] in this coat, together with the veins that are sent forth from the *Vena Cava*, and the arms or branches of it. Moreover the sprouts of the Nerves which meet with them both are variously complicated; and by that means, being all woven, one in another, they make a kind of Net, which covers the Pipe of the Artery all over; out of which exceeding small sprouts, of each kind of Vessels, are propagated into the other coats of the great Arteries that lie under.

2. After this Net-like coat comes another, which is glandulous, or rather that other sticks close to this which lies upon it. This membrane being all over full of small white glandules, is just of the same nature as the inner glandulous coat of the Stomach and Guts, which lies under the hairy veil, on the backside of which there is also a plat or complication of Nerves in form of a Net.

3. In the third place there is a muscular or fibrous Coat; that is to say, which is made of transverse or annular fibres joined very close together. These fibres being fleshy and designed for motion, encompass the body of the Artery, not in a single and thin row, as they are laid in the Vein-coat, but in a kind of heap, placed one upon another, they make a very thick skin. The heaps or ranks of them, in a par-boyled Artery, may be very easily separated, and plucked from each other; and they seem (just like those of the Stomach and Guts, that I formerly described) fleshy and designed for motion.

The fourth and inner coat of an Artery, which investeth the hollow of it, and covers the coat that lies under it, is thin and almost onely membranous. The small fibres of it being nervous and stretched out lengthwise, cut the annular fibres at right angles, and I suppose that these are the straight fibres, of which *Galen* and other Anatomists so often make mention: but those that they call oblique ones, I am of opinion were onely imaginary, because we cannot find them any where in this vessel. But it is evident that this error is very common among some Physicians, to assign, in most of the *Viscera* or Entrals and membranous parts, strait, transverse, and oblique fibres, out of a false supposition, that in every one of them there was an attractive, retentive, and expulsive faculty, and that the fibres of those three several sorts did perform these three offices; all which, to any one, that narrowly looks into it, will appear to be falsely concluded and said gratis. In the mean time I so far agree with *Galen*, that I acknowledge, there are four coats in an Artery, and that they are in this vessel just as they are in the stomach; except onely that in the *Viscera* or Entrals, the Net-like

Phar. Rat.

Part I.

The use of the Coats.

It is fibrous, that it may make its Systole and Diastole.

The other coats are made for the use of this.

complication of Vessels, together with the glandulous coat, is placed under the fibrous or muscular coat, but in the artery above it.

So much for the make of an Artery in general and the constitutive parts thereof: as to their offices, it seems to me, that the muscular coat, which is furnished with fleshy, round fibres, is of most principal use and operation. For this, as I hinted before, obeying the motion of the heart, in driving the blood about, observes its constant turns of Systole and Diastole, or Contraction and Dilatation; for whilest the fleshy fibres of it are successively and with wonderful celerity compressed behind the stream of the Blood, the course thereof must of necessity be most rapidly performed, from the heart to the ends of the Arteries.

As for the other coats and the vessels distributed about them, they seem all to be designed for the sole convenience and use of the muscular coat. For first the nerves and their branches, being disseminated all over the trunk of the Aorta and the greater arms thereof, appear on the outside, and according to their usual manner, carry supplies of spirits into the fleshy and moving fibres that are under, whereby to make them able to undergo the task of their Contractions or Systoles; and likewise convey to them the instincts or impressions of sympathetical contractions, as I before demonstrated. Then the lesser arteries (which are the next in order) that cover the inner surface of the outmost coat very thick, perform a double duty toward the muscular coat that lies under them, as other arteries do to other muscles and solid parts: that is to say, they convey and bring the nutritive juice wherewith they are nourished and grow, and the elastical particles for the continual supply of the spirits; and then the veins, which are yoke-fellows to the arteries, carry back all the blood that is not bestowed another way.

But whereas these blood vessels which are planted without the muscular coat, and complicated one among another, make up a net-like Plat or Web, from which there go only very small and slender sprouts (as it is also in the Stomach and Guts) though in most other muscles these vessels are interwoven with the fleshy fibres, and therefore make them look red; the reason of this difference seems to be, because it is convenient that the blood-vessels should be placed a little apart from the moving fibres of the Aorta and the Viscera, at some small distance, lest peradventure the blood running through them too copiously, should be sometime or other obstructed, and thereby cause an inflammation, or an abscess, which is present death. Wherefore for the greater security against such an accident, the glandulous coat sticks always fast to the net-like complication of those vessels; to the end, that the superfluous serosities [or serous, wheyish parts] which come out of the Nerves as well as Arteries, and are not immediately carried back by the veins, may be presently received in those innumerable glandules, and kept there till they are returned into the blood, lest they should run into the moving fibres and put them into convulsions.

The use of the glandulous coat.

In an artery the Plat of Vessels above the muscular coat is otherwise than in the Viscera or Entrails; and the reason of it.

The use of the inward coat.

But whereas the net-like Plat or complication of the vessels and the glandulous coat that sticks to it, is in the Aorta, placed above the muscular coat, and in the Viscera, below it; the reason, if I mistake not, is this, to wit, that those little vessels which ought to supply blood and juice very gently and moderately, may be removed to a distance from the heat and violence of that bloody torrent within the Aorta, as much as possible. But in the Stomach and the Guts, there is a necessity for the afore said heat of the blood, in order to the right performance of the offices of concoction.

The inward coat of the Aorta that investeth the cavity thereof, seems chiefly to be designed for these uses, to wit, to cover the channel of blood on the inside, and bound the other parts of this vessel: but besides that, it will be necessary to grant that it hath something of sense, and perchance of motion too. For being furnished with nervous fibres, it is affected like the cavity of the heart, by the blood that passeth through it; and therefore according to the perception of this part, the muscular coat is put upon quicker or slower, equal or unequal motions of systole and diastole. Moreover this coat hath, near the heart, for the space of about two inches strait or larger fibres that run lengthwise, and are as it were fleshy, in so much that I suppose, in this place, the Artery (in order to a greater impulse or forcing of the blood) is compressed and streightened behind the stream of blood, not onely in breadth, but (as it is in the heart) that at every systole it is somewhat contracted and shortened in its length too.

I could add in this place a great deal more, no less profitable than pleasant, concerning the structure and uses of this Vessel; for every part or portion of an animate body, though never so little, affords such fruitful and copious contemplation, that the Theory or Speculation of any one of them, if fully attended unto, would fill many pages, yea a whole volume. If I should go on in this Digression, I should Treat in the

the next place concerning a Vein; but omitting the consideration of that (seeing it makes little or nothing toward the explication of the reason of Physick or Pharmacy) let us pass on to the other sort of Medicins, called *Hypnoticks*, [or sleepy Medicins.] *Phar. Rat. Part I.*

S E C T. VII.

C H A P. I.

Of Opiates, or such Medicins as make a Man sleep.

AFTER Medicins that are Cordials, Hypnoticks [or sleepy Medicins] succeed according to the order of Method. For Sleep, when it comes upon one moderately and seasonably, is in it self the most cordial remedy. But this disposition [to sleep] is not used to overtake a man either always when, nor as it ought to do, but oftentimes disorders us either by its unwelcome presence, or by its too long absence. By the right rule of Nature, Sleep and Watching ought, like *Castor* and *Pollux*, to give place to each other, and change turns, according to the just limits of their reign. This vicissitude, as long as it is well observed, conduces very much not onely to the preservation of health, but to the improvement of the faculties of our minds. But if the dominion of either be too long continued, it thereupon immediately ceases to be possible, *ut sit mens sana in corpore sano*, i.e. for our mind and body to be both in health. Through immoderate sleep, all the faculties both our natural and animal functions grow very dull, in so much that thereby a man becomes more fit for his Grave than Humane society. On the contrary, long watching wasteth the strength of a man, and either weakeneth or perverteth the powers of Life. Wherefore among such Remedies as are suitable to our wants, the wise Creator hath abundantly provided for our necessities; to wit, that it should be in our own power to cause or repel sleep or watchfulness as often as we think it convenient; or if they be offensive at any time either in defect or excess, to moderate them. What Medicins (and by what manners of operation in humane bodies, they) use to procure these wished effects, lies now upon me to shew you; and first of all, I shall speak of Opiates, or such Medicins as cause sleep.

The vicissitude of Sleep and Watching is necessary to the preservation of health.

That you may the better understand what Hypnotick or sleepy Medicins do, and with what kind of operation upon the brain, animal spirits, and other parts, they procure sleep, I should repeat in this place, what I have elsewhere at large discoursed concerning the nature, subject, causes, and effects of sleep. For I have demonstrated the immediate subject of sleep are the animal spirits, not all of them, but onely such as inhabit the Brain and the Nerves, which are an appendage to it: that is to say, those which perform the duties of all the senses, and every sort of spontaneous or voluntary motion; always excepting those that serve onely to execute the necessary orders of meer Nature and Life.

In my Treatise of the Brain.

Having therefore premised these things, we must enquire concerning Opiates, first of all how they work upon the animal spirits, so that by the influence, as it were, of such a Medicin, they immediately sink and lie down, as if they were bound in Fetters, neglectful of their several offices. Secondly, We must shew in what part sleepy Medicins begin their operation; that is to say, whether in the Stomach, or the Brain, or whether they do it together, or successively in both. Thirdly, We must determine how far Opiates extend their operations, whether to the spirits of the Brain onely, and those that are inhabitants of its appendages as being the onely ones that are capable of natural sleep; or whether they reach also to others belonging to the Cerebellum [or hinder part of the Brain] and those that rule in those Regions. Fourthly and lastly, It will be worth our while to add some notable effects and accidents, together with the natural account of Hypnoticks.

There are four things to be inquired into, concerning the nature of Opiates.

1. As to the first of these, that is to say, that it may appear how Opiates work upon the animal spirits whilst they lay them to sleep, I have given my opinion largely in another place; and I have reason to believe, that they do not exert their force, by raising vapours into the head, nor opening the pores of the Brain, in order to admit any vaporous or otherwise soporiferous matter, but onely by deadning or defeating some

1. How Opiates work upon the animal spirits.

Phar. Rat.

Part I.



In what sort of
particles their
virtue consisteth

some of the animal spirits, so that the rest, being either in a consternation, or forced inward, or at least recalled from their usual efflux [*i. e.* flowing out] into the nervous parts, may forsake their functions, or for a time remit their labour. Now that it is so is very evident, because Narcoticks [or drowzy Physick] if taken in a Dose too big, are mortal, for as much as in so great a quantity they overpower the spirits, and make it impossible for the vital functions to be performed. But when they are given in a due quantity, and with all circumstances accordingly, they restrain the excesses of the sensitive soul, in as much as that they conquer and subdue some of the animal spirits, and totally destroy the rest: by which means the soul being more contracted, and retiring, as it were, into it self, lies down in quiet, just almost in the same manner as throwing Water upon a Fire that breaks vehemently out, immediately beats down the aspiring flame, and brings it within moderate bounds.

But if it be inquired farther, in what sort of matter, and how disposed, the Narcotick virtue of a Medicin consists? No manifest quality, in this case, as of cold, heat, or any other kind, must be pretended; nor ought we presently to fly to I know not what occult ones. A man may suppose, that Opiates consist of such particles as are most disagreeable to the animal spirits, and are extinguishers or rather poisons to them. It will not be easie to determine of what nature, or make, the contrary particles of both sorts are, because they are not perceptible to sense, nor does the analogy or proportion of particles so opposite appear in any other subjects. But (that we venture to guess) I am of opinion, that seeing the animal spirits are very subtle bodies, composed of a spirit and a volatile salt, both joined together and highly exalted, the Opiates, on the contrary, are made of a stinking sulphur, that is, of sulphur united with fixed salt and earthy matter, raised to a violent degree; which kind of compositions, it is well known, are such great enemies to the subtle texture of the animal spirits, that sometimes at a distance, by meer emanations that flow out of them, though not perceivable to the smell, they overpower them; but their particles (when they are inwardly taken) being diffused through the blood and nervous juice, poison, and as it were, defeat or slay some troops of the animal forces where ever they meet them. But in what places this is chiefly and primarily performed, comes now in the next place to be the subject of our enquiry.

In what places
Opiates work
primarily and
chiefly.

2. When I formerly treated of Sleep, I shewed that this disposition, according to the ordinary course of Nature, begins from the *Cortex* or outside of the Brain; that is, that the spirits which inhabit there and keep guard, as it were, in the outmost confines of it, do first retire, and laying down their Arms, lie idle; and then immediately that all the rest, who have the same leisure, do in like manner rest themselves and fall asleep.

First, In the
Cortex, or out-
part of the brain

Those first spirits, when they are going to rest, forsake their stations, and either because they are wearied, and weakened as to their forces, spontaneously relinquish their Posts till such time as they are recruited; or because they are beaten thence, or because they are enticed inwardly by some allurements. The first of these happens ordinarily every day, through the influx or inundation of the nervous juice and sometimes of the serous liquor. For those humours being poured out of the blood (when it is full) which runs through the outmost borders of the Brain into the cortical or exterior part thereof, fill all the pores and passages, and consequently restrain the spirits, and hinder them of their free expansion, whereby they grow watchful. The reasons why, and the manner how all these things come to pass, I have already declared at large, in another Treatise: from which, when they are well considered, it will be rational to suppose, that the particles of every Opiate, after it is taken, when they are transmitted into the blood, and have circulated with it, do exert their drowsie quality most chiefly upon the *Cortex* [or, as it were, the Bark of the Brain,] that is to say, that they in this place meet with the first party of animal spirits, and that they defeat, or rather destroy a great many of them that are in the forlorn hope; by which means afterward the remaining spirits of the same troop, being now grown weaker, retreat, and seeing their emanation is stopt, fly back toward the middle of the Brain; and whilest these thus withdraw themselves from the Battle and march off, all the rest that are placed in the organs of sense, as it were in so many Watch-Towers, having lost their recruits, strait follow them, and leaving their Guard, retire to take their rest.

When they kill
the outmost spi-
rits, they make
the next to them
retire.

They lessen or
recall the af-
flux of them to
the nervous
parts.

In this manner the particles of Opiates cause sleep, in as much as they defeat and destroy some animal spirits that stand in the front of the Battle, near the cortex of the Brain, and by that means repel all that are near them, putting them so to flight, that the influx of them into the senses is suspended: but by what means, and that sometimes in so short a time (as now and then it falls out) to wit, presently after the Me-

Medicin

dicin is taken, and scarce yet dissolved in the stomach, sleep creeps upon a man (since one would think it should require some time for the sleepy particles to be conveyed from the stomach into the blood, and afterward by way of that into the brain) is not easie to determine. To this I answer, First, That the way from the stomach through the blood to the forepart of the head is easie enough, and may be gone over in a little time; but besides that, I am induced to think, that Opiates sometimes, by working more immediately upon the stomach, and by the meer contact thereof, before they have any commerce with the blood, do in some measure invite us to sleep. Among the evident causes of this effect I have elsewhere justly assigned, oppression of the stomach: For how many are there that grow immediately aslepy by eating gross meats that are hard of concoction and disturb or over-burden the stomach? The reason of which seems to be, that seeing there is a very near relation and intimate sympathy between the spirits of the stomach and those of the brain, in so much that each of them mutually bear the afflictions and misfortunes of the other (which is easie enough to be made out by many and many instances) from hence it easily comes to pass, that through the extreme oppression of those spirits which preside in the stomach (in that they are hindred, and as it were repelled from their free expansion) immediately the substance of the whole soul (and especially that most principal part which governs the brain) is at the same time contracted, furls its sails and submits it self wholly to the yoke of sleep. How much more reason have we to suppose, that when ever the spirits of the stomach, imbibing the opiate juice, are poisoned and destroyed in great numbers, that immediately all those which keep guard about the Brain, are quite defeated, and oppressed with sleep, which is not onely the image of death, but sometimes also the same thing as death it self? Indeed I have elsewhere related a story concerning such an effect as this from the taking of *Opium*, which is very true, though very strange; that is, of a certain strong man pretty well in health, who having taken too great a dose of *Laudanum*, to ease him of the pain of the Colick, complained immediately of an intolerable oppression in his stomach, and a dizziness or drowsiness, and within twenty four hours died; nor did he fall into any sleep before he took his last.

These are the chiefest and most usual places (that is to say, the Stomach and the cortex of the Brain) in which Opiates, by exercising their virtues begin or end their invitations to sleep. But besides these, it is apparent from common observation, that when they are given several other ways, they imprint a kind of drowsiness upon the whole sensitive soul, or upon some portion of it, which is naturally and ordinarily capable of sleep. A plaister of *Opium* applied to the forehead, and likewise a Clyster impregnated with the dissolution of it, cause sleep. The like effect some have found, to their sorrow, by putting it into an hollow tooth or into their nostrils; so that it is evident, this Medicin, when ever it can be admitted to the animal spirits, destroys the next of them that come to hand by mere contact: and that sometimes to such a degree, that there ensues upon it a contraction or dejection of the whole soul (which is as it were put into a commotion) and an eclipse or fainting of all the principal faculties: not but that it is also very likely that some particles of the *Opium* are conveyed out of those places through the blood into the cortex of the brain.

3. Having already pointed out the Arms of Opiates, by which they execute their baneful effects, and the Scenes where they primarily or chiefly act their Tragedies; it comes next before us, to inquire concerning the sphere of their activity; that is to say, upon what particles or parts of our bodies they work, and how far they extend their virtues into them. For what hath been said it is plain enough that they work upon the animal spirits; but the question is, whether they do not also reach the blood and other humours? Indeed the very small dose in which they are given, makes me think the blood is not tainted by them: for from the littleness of that, it seems to me very improbable, that the whole mass of blood should be poisoned, or corrupted; and likewise because Narcoticks (though frequently administred, cause no such marks or risings in the skin or entrals, as are usually seen when the blood is any way venom'd. Moreover those people who make *Opium* so familiar to them that it doth not hurt their animal spirits, though they take it daily, and in great quantities, feel no distemperance in their blood. But in the mean time, we must not imagine that the particles of *Opium* are agreeable to the blood, and assimilated by it, but rather that they are heterogeneous altogether, and unminglable; wherefore they no sooner get into the mass thereof, but they are presently expelled by it again; and thence being partly poured into the cortex of the Brain, cause sleep; and partly being cast forth through the pores of the skin, produce sweating, and many times a very troublesome itching, as I have observed in many cases. As to other humours, truly there is no reason to think that

Phar. Rdx.
Part I.

The reason of it

3. How far the virtue of Opiates is extended, and into what parts.

They do not poison the blood, as they do the spirits.

Phar. Rat. that Opiates leave any stain upon the *Serum*, the nervous liquor or the nutritive juice; in so much that their virtue and operation seems to respect the animal spirits only.

Part I.

Opiates work chiefly upon the animal spirits.

But yet they do not affect all the animal spirits alike; but Opiates given in a moderate dose, do primarily operate upon those spirits only, to which the privileges of natural and ordinary sleep are allowed, not so much as touching or molesting any of the rest. Wherefore when a man takes *Laudanum*, it binds both his inward and his outward senses, though in the mean while pulsation, respiration, and all the duties of concoction and separation are performed after the usual rate; and after a certain space of time, the spirits of the sort aforesaid, when their forces are recruited, rouse up themselves again, and shaking off the chains of sleep, return of their own accord to their wonted watch and ward.

Sometimes their force reaches the Cerebellum, or hinder part of the brain.

But if an opiate Medicin be stronger than it should be, it doth not onely lay fetters, wherewith they are a long time shakled, upon the spirits which inhabit the brain and the appendages thereof, but it also extends its drowsie powers into the other Territory of Lises Dominions; so that after a larger dose of it than ordinary, the appetite is most commonly rebated, respiration very much streitned and rendred not onely difficult, but also unequal, nay sometimes also the motion of the very heart is so far impaired, that immediately the pulse grows weaker, with a cold sweat, and a dulness, or a kind of faintness in all the faculties, in so much that such a Medicin is sometimes attended with a perpetual sleep; the reason of which is, because the poison of the *Opium* being diffused a great way, gets into the Globe of the *Cerebellum*, and destroying or subduing the spirits that inhabit there in great numbers, causes the motion of the heart first to grow weaker, and after that, quite to cease; so that the vital flame is thereby extinguished.

4. The good or bad effects of Opiates.

Having premised these things concerning the nature, the manner of operation, and the subjects of opiate Medicins, together with their limits and sphere of Activity, I must now at last recount to you the effects and principal accidents, both good and bad, that usually attended the use thereof; and then give you some cautions touching the right method of Hypnotick Physick. First, Therefore let us see, in what manner and in what cases these opiate Medicins are commonly beneficial.

5. The good respect either the Spirits or the Blood and Humours.

The good or emolument that is usually procured by the use of Opiates, belongs either to the animal spirits, or to the blood and humours: of which the first are affected primarily and more immediately, but the two last onely secondarily, and by mediation of the former.

They are good for the Spirits in respect to sense and motion. To both in a different kind.

Whenever the animal spirits, being excited above measure, act either too much, or irregularly in the discharge of their several offices; Narcoticks given in due time, afford very frequently great assistance toward the allaying of their fury and disorders. Now such exorbitancies in them as shew when Opiates are proper, respect either Sense or Motion. The former of which functions being twofold, the greatest excesses of the internal senses, are Watching, and being Mad or Delirious; but the indisposition of the outward senses, that most requires this kind of Physick, is Pain, Inequality, or irregularities of motions, which are to be reduced by Narcoticks, are first of all a violent pulse, convulsions in the heart or bowels, and likewise the excessive and impetuous evacuations of the latter. So many there are, and such different cases, wherein, whilst the animal spirits, like wild Horses, run up and down, or leap over their bounds, they ought to be restrained or reduced by Opiates, as with a bridle. Several instances of each whereof, together with the manner, how they are prepared, and the reasons of their operations, I shall here briefly subjoin.

In respect of the inward senses, to watching.

First therefore Opiates are necessarily and most properly used in case of Wakefulness; in as much as Sleep, which is a state quite contrary to it, and consequently cures it. How many ways and by what means watching is usually caused, and continues long upon a man, I have lately declared at large in a Treatise which I have written; in all which cases, seeing the animal spirits, being too wild and much disturbed, exert or shew themselves more briskly than they should do, bloating and irradiating [or enlightening] not onely the organs of sense, but especially the outmost borders of the Brain in all parts; the particles of *Opium* being transmitted hither by conveyance of the blood, do presently destroy or subdue the animal spirits that keep guard in the front of the Army, in so much that all the rest that are nearest to them, being forced inward are put to the stand, and much restrained from flowing all around into every part; whereupon immediately all the outward spirits that inhabit the organs or instruments of any spontaneous sense or motion, being bereft of the influx of those in the Head-quarters, forsake their Guard also, and retiring inward, lie down and rest themselves.

And 2. Mad-ness.

Secondly in Delirious cases, Opiates are oftentimes used with good success (though other-

otherwhiles they rather do mischief, as I shall hereafter declare) the reason of which is, that when the spirits being too much excited, and as it were, set a madding, within the Brain, can easily leap over the usual and trodden paths of their constant journies; then a Narcotick Medicin arriving at the borders of the Brain, restrains those excesses, which are usually as apt as Hounds to run beyond their scent, and for a time hinders them from all motion; so that many times when they move afresh, they return to their former tracts and perform their wonted functions very well.

Thirdly, *Opium* is always reckoned of most excellent use to allay all sorts of pain, whereupon it is justly called *Nepenthe*, and is a remedy really divine. And truly we cannot sufficiently admire, how, when any bowel or member is under any signal and intolerable torture or pain, this Medicin, like a Charm, gives the Party immediate relief and ease; yea sometimes without sleep, or at least before it comes upon him. But that, which is yet more wonderful, is, that as long as the particles of *Opium* continue to work and exert their Narcotick power, yea sometimes also when the sleep is over, there remains in the part affected, the greatest alleviation and freedom from pain. But afterward when the force of the Medicin is spent, the torments presently return, nor do they abate of their cruelty, unless they are again enchanted by the same Medicin.

Whilest I inquire into the reason of this I cannot easily find out in what part a pain-removing Medicin [called an Anodynous Medicin] chiefly operates and exerterth its virtue, whilest without sleep, or when that is over, it allevieth pains, and for a certain time gives a man perfect ease: that is to say, Whether the Narcotick power of it be laid out upon the part tormented, or upon the common organ of sense, or upon the whole sensitive soul. The reason of the difference between the parts proposed, is because pain caused in one place is felt in another, and the effect of it is diffused through the whole soul. The continuance of it consisteth in this, that the nervous fibres are very much irritated and plucked from each other, by some incongruous and very disproportionate matter, in so much that the spirits which are in them, are immediately distracted, and being forced from their equal expansion, are put into a confusion. But the sense of pain is caused from this, that the disturbance of those spirits being conveyed by a kind of undulation [or waving, as water doth when you throw a stone into it] through the nerves to the common sense, to wit, the *Corpora striata* [parts so called from their being streaked] moves the spirits that inhabit there, into the like distraction; which sort of commotion, proceeding farther into the *Cerebellum*, stirs up the imagination, and thence immediately returning, diffuseth, or spreadeth a disturbance or inquietude through the whole substance of the spirits. Since therefore Pain is a malady of so large an extent, and of so different a nature, we ought to inquire what sphere of activity Anodynous [or pain-removing] Medicins have.

Concerning this there is no room to doubt, but that whenever after the taking of *Opium* Sleep is first brought upon a man, he is consequently free from all pain; for then an *anæsthesia* [or freedom from pain] immediately ensueth as the effect of it; in as much as those spirits also which actuate the common sense are bound up with them that inhabit the Brain; and consequently, though the tormented part be never so provoked, all sense of pain is obstructed; but whereas when the Patient awakes and remaining so, performs some animal functions very briskly without any pain, for so many hours after he hath taken the *Opium*, and that when the force of the Medicin is quite spent, immediately the same torture returns upon him, this seems a question for *Oedipus* or *Apollo* himself to resolve.

For the solution whereof, we cannot say the spirits of the part affected, and those that reside in the common sense; that is to say, that the one or the other, or both of them together, are bound by the Anodynous Medicin. For it is not credible, that the particles of the *Opium* do so penetrate and deeply enter into the brain and nerves, that when they have passed through that without hurting of it, they should descend in so short a time to the utmost borders thereof; nor can we imagine that the spirits which reside in the *Corpora striata* (seeing that when the Party is awake, he continues for some time without pain) and are awakened to receive any impressions of other sensibles, grow deaf onely to the approaches which are made from the part that is in pain. Since therefore this freedom from pain after sleep is over, ought not to be referred either to the part affected, nor to the common senses being stupified by the *Opium*, let us see how the reason of it may be deduced from a kind of Narcotick indisposition of the whole sensitive soul. Now that will easily appear, when we have premised these two things.

First, That it is necessary to the creating or continuance of any pain, that a plentiful

Phar. Rat.
Part I.

In respect of the
external sense,
for pain.

How Opiates
remove pains
without sleep,
or after it.

The reason of it;

It consists in
these 2 things,

Phar. Rat.
Part I.

1. There is required to make pain, a copious flowing of the spirits to the part affected.
2. which Opiates hinder.

For the same reason Opiates remove Convulsions.

tiful quantity of spirits flow still in the part affected; for the heat of such spirits, whilst they riot there, their distraction and the mutual striking of some against others, are the very immediate cause of such a troublesome perception as is called *Pain*; wherefore if by the streightning of the nerves the afflux of spirits to the part that is grieved, cannot be hindered or much diminished, the pain must of necessity cease, because the spirits being bereft of fresh supplies and succours, will lie so thin and scattered in the fibres, that they can scarce touch one another, at least they will not at all break out into fury and indignation.

Secondly, That destitution or withdrawing of the spirits which is here required, and cannot be procured by no other means or endeavour, is often and usually produced by Opium. For from the particles of this Medicin besetting the borders of the Brain, not onely some of the outmost spirits, which are as it were, fore-runners or Scouts (as they call them) are destroyed, but the first sources of them within the body of the Brain and Cerebellum, and their efflux thence into the nerves, are presently very much suppressed; in so much that during the operation of the Opium, they are discharged much more sparingly and minutely into the heart, bowels, and all other parts. Hence it is that the pulse and the respiration remit somewhat of their vehemency and quickness, and sometimes on a sudden the one becomes weak and the other difficult, and many times also an unusual languishing and dulness seizes all the limbs and joints. Moreover, hence it is that the *viscera* or Bowels, which before were put into convulsions, either of an expulsive nature (that is to say, by Vomiting or Stool) or of a painful nature (as in the Colick and Stone in the Kidnies) lay aside their disorders: to wit, for this reason, because that whilst the supplemental and recruiting bands of spirits in the part affected are deficient, those few that survive, have no longer leisure for tumult and rage: but on the contrary, in order to their being altogether quiet and safe, they lie still: but then afterward when the particles of Opium are blown off and scattered, and the stock of spirits in the Brain, and their emanation thence into the nervous parts, is renewed, so that they flow down again with a full stream to the parts affected, and fill their fibres, immediately the same convulsions or pains return by reason that the spirits are again increased and provoked, as they were before.

They are good in the Gout and Stone.

No question, but according to this manner of operation, and according to the reason just now assigned, Opiates most commonly allay the greatest pains, and give a man ease, either with or without sleep, yea and continue it for some certain time even when that is over: which space or interval being past, the pains immediately return, and are in a short time increased to their wonted sharpness. This kind of effect wrought by Narcoticks, which is vulgarly known in the cure of the Scorbutick Colick, seems like some Exorcism or Charm; in as much as the pain, like a Daemon or evil Spirit, cannot be bound but for a certain time, and then begins to play its pranks and rage again. Among those painful maladies for which Opium is a cure, the Gout and Stone in the Bladder are justly numbred in this place. For in gouty pains that Anodyne Medicin affords many times extraordinary help, and such as is almost divine. The latter of these diseases, seeing it rages cruelly in old men, and cannot be cured by cutting, admits of no other remedy but Narcoticks for its relief. Whereupon I have persuaded some persons to a constant and daily use of *Laudanum* or *Diacodium*; which they have done with great ease to their life, and suffered no injury by it, though they have daily increased the dose of it, and risen to a great quantity. So much for the means of healing or helping, which Opium usually furnishes, in order to the regulation of the sensitive faculties: let us see at last how much this *Panacea* [i.e. all-healing Medicin] conduces to the allaying or curing the irregularities of animal motions.

2. How Opiates cure the irregularities of motion.

2. The immoderateness or irregularity of the moving faculty, for the right composing whereof, the use of Opiates is proper, respect most principally the Heart and Bowels, (for Convulsions about the head or limbs do not so necessarily require this kind of Physick) to the first of which we must refer the Pulse and Respiration, as often as either of them is more quick or vehement than it should be. For seeing that in Fevers, the motions of the heart and lungs, growing more vigorous, drive the blood about very rapidly, in so much that it is excessively perverted both in the heat and temper of it, and cannot discharge its dreggy parts which are so intimately mixt with it, the force of those parts is somewhat rebated by giving of a Narcotick; so that the blood circulates gently and temperately, diffuseth it self with less heat, and being dissolved in its constitution, casteth forth its serum and impurities by Sweat and Urine. Opiates extenuate and depress the actions of Pulsation and Respiration, for that they in some measure stop the flux or emanation of the animal spirits in the Cerebellum, and

3. They diminish the vehemency of the Pulse and of Respiration.

and diminish the stream of them from thence into the nerves designed for the heart; *Phar. Rat.* which if it be done to excess, there ensues upon it a great dejection of the vital faculties, *Part I.* which sometimes proves mortal.

Respiration (not onely as it is vehement, but also) sometimes as it is interrupted, *They regulate the disorders of Respiration.* convulsive, or otherwise in several manners irregular, doth frequently require Narcotick Medicins; which are usually good, above all other Remedies, in Coughs that are vehement, or very frequent and continually troublesome to a body. But in fits of the Asthma, wherein through the great pains and labour which the organs are put to, the Patients seem to be even in the very pangs of death, a dose of a good Opiate, like some Divinity, makes all things presently serene and calm. Of which the reason is, that in those Maladies, where any thing that is troublesome besets the most vital parts, the spirits that reside in them being exceedingly provoked, break out into outrageous disorders, and by over-acting their parts, disturb and pervert the whole state of things; wherefore, when after you have taken a Narcotick, and bereft those furious spirits of their supplies, they are presently extenuated, and being as it were destitute of all succours, lay aside their inordinate practices. Moreover, Narcotick Physick seems no less necessary against the immoderate, or convulsive motions of the Bowels, to wit, of the Stomach and Guts; for it is used oftentimes to give very great ease in extraordinary vomiting, and excessive or violent purging. Dysenterical Maladies [or fluxes] can scarce be cured without Opium; not because this Medicin fixeth juices and humours that bubble and are irregular, but it stops the expulsive convulsions of the fibres, and that partly within the cavities of the Bowels themselves, by stupifying the spirits which reside there with its meer contact, and partly by suppressing the spirits within the Cerebellum, which would flow thence into those parts; of whose succours they being destitute, do easily relinquish their convulsive motions. I could upon this occasion recount to you either the convulsions or pains of other parts, which are usually allayed or removed by Opium; but I have already said enough of the operation and effects of this Anodyne Medicin, which are exerted primarily and chiefly upon the animal spirits; let us therefore next enquire, what power and alterative force it hath upon the blood and humours.

Now that Opiates operate upon the blood and humours of our bodies, and do restrain *How Opiates work upon the blood.* their disorders, there is scarce any one of the Vulgar but knows, and is satisfied. In Catarrhs and Defluxions of all sorts we fly many times to these as the last *Asylum* or Refuge. These very powerfully stop all bloody evacuations, as also those of the Serum, which, when at any time they are excessive and colliquative [or of a dissolving nature] they restrain or reduce. They repress the immoderate ebullition of the blood when it is in a feverish heat, and take off the excessive inflammation thereof. In fine, they most successfully allay all waves and storms raised in our bodies, upon almost what account soever, and oftentimes restore to the blood, when it is disturbed, a serene and quiet temper.

Though these kinds of effects are in a great measure produced by mediation of the affections of the animal spirits (as I have formerly hinted) for in as much as the nervous fibres being inordinately contracted, disturb the blood and humours, and force them to several fluctuations and exundations [*i. e.* floatings and overflowings] for that reason the suppression of those Spasms by Opiates, makes the Sea of them calm again; yet it seems probable also, that the Opiate particles, whilst they are confounded with the blood, create in the liquor thereof some kind of alterations by their meer mixture. For I told you before, that they are altogether heterogeneous, immiscible [or unminglable] and likewise untameable: and therefore seeing they appear to be not all enemies or injurious to the liquor of it, they may in some sense be taken for Antidotes; that is to say, such sort of Antidotes, as being mixed with the blood, pass through the mass thereof quickly, and almost untouched, and in their journey make way for the serum, and other recrements or malignant impurities that are closely shut and bound up with it to go out, yea drive them forth before them, by opening all the pores and avenues. Whereupon it is not altogether without reason, that Opium is an ingredient in the compositions of the chiefest Antidotes, as Treacle, Michridate, and Diascordium, as if it were a resister of venomous humours.

Indeed that the particles of Opium, when a man hath swallowed it, is soon transmitted into the blood, and quickly passeth through the mass thereof, appears from this, *They soon pass through the blood.* that they immediately after the Medicin is taken, being carried up into the Brain, procure sleep, and give a man ease from pain. And besides that, it is evident from common experience, that they (where they are agreeable) provoke Sweats and bring away Urin, in so much that these effects are commonly reckoned among the Virtues of Opium. Moreover that the particles thereof are not venomous to the blood, but rather

Phar. Rat.

Part I.

And therefore
are called An-
tidotes.They cause
Sweat and
Urin.A notable Hi-
story of their
Efficacy.

rather Antidotal is collected from this, that in the Plague, Small Pox, and malignant Fevers, yea in any other Fevers *Laudanum* is given many times with great success. In the mean while I do not well understand those qualities which some men attribute to this Medicin, that is to say, of fixing and thickening the blood; unless perchance it be said to do so, in as much as that by opening the constitution thereof, it causeth the serous part of it to be copiously separated and carried off, so that the liquor which remains grows thereby more compact and thick.

For as I have found by frequent observation, that Opiate Medicins do dissolve the blood, and sometimes, like Antidotes, most powerfully provoke Sweat and Urin, so from the following Story (which I add here for to sum up all) I will make it as plainly out to all the World. I was formerly consulted upon the score of a Gentleman who was very much disordered in his body, and troubled with nocturnal pains which proceeded from the Pox (which was either very illy or not at all cured in him) to whom I prescribed many things, but all in vain; because he being very much averse to Physick, would take scarce any thing else except a dose of *Laudanum*, which I gave him once or twice a Week to alleviate his pains. In a short time growing hydropical, he swelled with an *Ascites* [a Dropsie that makes the belly swell like a Bottle] and likewise with an *Anasarca* [a Dropsie that affects all the flesh] to that degree, that he could hardly turn himself from one side to the other without the help of Servants. When he was in this condition, I being sent for to him again, and finding him averse to the Rules of Physick, did all that could be done; and that was onely to give him warning of his death, which was not far off, and certainly to be expected, that he might compose and fit himself for Eternity. He, being not much troubled at what I said, desired me very earnestly, that in order to his dying so much the more easily, he might take my *Laudanum*, which I had permitted him to take before in a small quantity, when he pleased, or at least every night; which having with some admonitions granted him, I went away, and as I thought, bid him the last farewell. Afterward he took that Medicin daily, and as daily increased the Dose, so that in a short time he had consumed an incredible quantity of it. By using this onely Medicin constantly, he grew better and better every day, and within a Moneths time was so well, that being free from all swellings and pains, he had a good stomach, and walked abroad. By the daily use of this Opiate, his Distemper, which troubled him very much before, left him; and being every night dissolved into a great Sweat, he also made a vast quantity of Urin. I could here tell you likewise of many other cures of Diseases that were thought past cure, which were performed by the help of Opium alone; but because it would be tedious, and somewhat beside my purpose, I therefore shall onely add in this place one or two, which are in short these.

The second Story.

About three years ago, a noble Lady, after an Autumnal Fever, fell into a severe Colick, with vomiting, and sharp pains, that afflicted her Bowels and Limbs most miserably. Remedies of all sorts, both outward and inward, though applied for several Weeks with great care, did her no good at all; but the poor Lady within 20 days was reduced to such a languishment and extenuation or thinness of Body, that there was but very little or hardly any hopes of her recovery: for being confined to her Bed, and almost always without sleep, she was troubled with a constant pain or sickness in her stomach, throwing up all she swallowed, whether Physick or food, by vomit, and likewise she underwent almost continual torment and pains about her belly and loins, as also sometimes in her head and limbs. Being sent for to her, I tried many sorts of Medicins, but nothing agreed with her except a Dose of *Liquid Laudanum*; which I ventured to give her to alleviate her pains, at first onely twice a Week, and that not without fear and caution. She at last desired that she might take that Medicin every other, and after that every night continually. So having used daily without any damage, she gained in the night time sound sleep and pleasant, and in the day time a freedom from pain and a good stomach; and by that means gathering up her crums again, she began to rise out of Bed, and daily to eat good meals; but then she could and had a desire to take other Medicins, till at last she was quite well again.

The third Story.

Nor did a very fine Woman, who for many years was subject ever and anon to pains of the Colick, any less cry up and celebrate the praises of this divine Medicin. For whensoever she was sick of that Distemper, and was in most miserable torment, she could not be relieved by any other Medicin except Opium: wherefore she took a Dose of it every night, till such time as the morbidick or diseased matter being quite spent, she at length became free from all trouble and pain.

C H A P. II.

Phar. Rat:
Part I.*Of the Injuries and Inconveniences of Opium; to which are added
Cautions concerning the Use thereof.*

Hitherto I have shewn you the good effects, and as it were, the Angelical face of Opium, together with the manner and reasons of its operation. But if you look upon the other side of it, (as when you turn the reverse of a Coin) it will appear altogether like a Devil; and therein we shall discover no less hurt, and ill effects, than we did good ones in the former. For there is so much poison in this All-healing Medicin, that we ought not to be by any means secure or confident in the frequent and familiar use of it. Wherefore we ought to be admonished as well concerning the loss as the profit that accrues from it, so that we (like those that go a Voyage to Sea, when we understand on both sides, what Ports we may touch at, and what Rocks we must avoid) may incur the less danger.

I have by the sad experience of some People, found that the use of Opium sometimes is noxious, and of ill consequence; in as much as some men immediately after the taking of it, have fallen into an everlasting sleep, and others by an excessive or unseasonable Dose of it, have either shortened their lives, or made them ever after troublesome and unhappy by the hurt it hath done to their principal faculties: Instances and examples of this kind are every where to be met with from the practice of Quacks and Empericks. I remember some that by swallowing a Pill of *Laudanum*, have presently been put into so profound a sleep, that they could never be wakened. They lived indeed for three or four days, and were pretty well, as to their pulse, breathing, and warmth, but were not to be recovered by any remedies or tortures to their senses, or made to awake. Yet I have observed some others, who having taken Opium, have slept but moderately, yea sometimes very little or scarce at all; but as to their pulse, respiration, and heat, they have been immediately worse: for they used presently after the taking of this medicin, to languish, and thereupon more and more to fail of breath; nor could their strength be repaired by any Cordials, but they fainted and died insensibly. I have elsewhere told you a Story of a strong man, who was killed with Opium, having no sleep before that which was his last, that is to say, Death came it self upon him. He complained as soon as he had taken the Medicin, of an extraordinary oppression and cold at his stomach, and by and by was taken with an excessive languidness, together with a dejection of all his spirits, and a chilness in his extreme parts, [the Feet, Hands, &c.] and within four hours, complaining often that his eyes grew dim and were quite blinded, he expired.

For hence it is easily gathered, that Opium doth not destroy life onely one way, and that the same still, but that it hath two principal methods at least by which it kills men. The reason of one consists in this, that the particles of the Medicin taken, do first and more immediately affect the Brain; and of the other, that they do in the same nature work upon the Cerebellum. As to this latter the business is thus: if, after the Medicin is taken, it happen perchance, that the circuit of the Cerebellum be so beset by the Narcotick particles, that the outmost spirits being immediately extinguished, the afflux of the inward ones toward the heart, be diminished, and so by degrees cut off; it will of necessity follow, that the Heart and all the instruments of Respiration, will first grow fainty in the discharge of their vital functions, and by that means totally cease from their labour, though in the mean time the Patients awake, and are free from all drowsiness, well enough in their senses, and very lively as long as they live. But if the opiate particles break in first, and with a full force upon the borders of the Brain, and set upon the inhabitants of that chiefly, in so much that having presently conquered the outmost spirits, they put all the inward ones that are in the middle of it, into a consternation, and so far suppress them that they cannot rise again to rally their forces a second time, then immediately a deep sleep, or an invincible and perpetual slumber ensues, though the pulse in the mean while, and the respiration continue for some time in their due state.

Besides these kinds of destructive Tragedies which Opium upon several occasions acts upon the life of man, this Medicin hath likewise many other ways of doing hurt, whereby it oftentimes is injurious to some private function or part of the body. It would be tedious to reckon up all the sorts of lesser evils, which Narcoticks are at any time the cause of, and therefore in this place I shall onely tell you what maladies

How many and
what ways O-
pium useth to
hurt us.

The poison
works first upon
the Brain, and
then upon the
Cerebellum, or
binder part of
the Brain.

happen

Phar. Ra. happen in the head, what in the Breast, and also what in the lower belly, by the im-
 proper and unseasonable use thereof.

Part I.

*It is hurtful
to the Head, the
Breast, and the
Belly.*

*How Opium
works upon the
Turks.*

1. As to the first, it is very vulgarly known that the principal functions of the soul, to wit, Memory, Discourse, and sharpness of Wit, are oftentimes very much impaired by Narcoticks. The frequent use of them in many men weakens the memory. I knew a certain person, who by taking an extraordinary dose of *Laudanum* when he was in a Fever, quite lost that faculty; and after several Weeks, when the use of it began to return, he remembered onely such things as he had done within a particular space of time, but nothing of what he had before and after transacted. I know that some have contracted, by taking this Medicin, a dulness or stupidity of mind, and others grown mad. Hence it is (saith *Freitagius*) that whereas *Prosper Alpinus* and *Bellonius* tells us, that the *Egyptians* and *Turks* eat Opium, to make them chearful, bold, and inclined to Venery, yet they add, that the devourers of Opium, though they seem to be in good health, and not at all injured by the use of it, yet that they are thereby rendered more frigid and their functions or faculties are much the worse for it, that they appear most commonly as if they were drunk and dull; that they become heavy, stupid and out of order, that sometimes they affirm a thing, and in the same breath deny it; so that they are cautious who they talk or converse with: and that it is also become a jeer, not unlike a reproach among them, which they cast upon one another, *Thou hast eaten Opium*, just as when our Countrymen upbraid a man with being drunk or dozed. *Freitagius* in his Book of *Opium*, ch. 3. The reason of this is plain enough, from what I have already said, to wit, that Opium produces the effects now mentioned, in that it first and most principally strikes at the Brain: and whilest that there it destroys, or conquers some animal spirits, it prevents many others from their usual ways of emanation, and draws them into by-passages. But whereas Opium is devoured by the *Turks* (and I may say also by some of our Countrymen too, that are fortified, and have gained a kind of Armour against the poison of it, by long usage) in great quantity, and that without any damage, or at least without any hazard to their lives; the reason is, because the particles thereof, though at first they are hurtful and venomous to the spirits, yet by frequent use they at last grow more agreeable and familiar, as we observe of the smoak of Tobacco taken into ones mouth through a Pipe; for though at first for some days it usually brings a giddiness, and oftentimes a vomiting or purging, yea a cold sweat upon us, with trembling and frequent fainting of the spirits, yet at length we take it undisturbed, nay with great delight. But for as much as Opium, in a large Dose, puts such confidence and resolution into them, that they go to battle without any dread, the reason seems to be, because that Medicin by stupifying the spirits in some measure stounds them, so that they endure the encounter of all sensible, though never so terrible things. Lastly, Whereas it is said that Opiates provoke Lust, when on the contrary they should seem rather to suppress and tame that appetite, by extinguishing the spirits, I say (if it really have that effect) that the seminal or generative moisture and the spirits that flow therein, do not descend from the Brain, but are poured immediately into the spermatick Vessels; and therefore in as much as Opiates either hinder or diminish the generation of the spirits within the Brain, they perhaps make them run more plentifully into the instruments of propagation.

*2. what hurt
Opium doth to
the Breast.*

2. That Opiates are sometimes enemies to the Heart and the Breast is manifest from this, that they depress and diminish the Pulse and Respiration, yea sometimes also (as I have shewn before) cause to grow weak and by degrees quite to cease. Wherefore in Fevers, when the blood being extraordinarily depraved, seems like to have no *Crisis* [judgment to be made upon it] or at least not a good one, and that at the same time it supplies but very few spirits, and those weak too, to the animal forces, Narcoticks are most commonly, and almost continually hurtful, and as it were poison. For though in the Plague, and in malignant Fevers, as long as the Pulse and the Breath is strong, *Treacle*, *Mithridate*, and *Diafcoridium*, yea and *Laudanum* are many times given with good success; yet if at any time in those Diseases, and in other Fevers that are not very malignant, the vital functions languish, we ought to use those famous Antidotes very sparingly, but stronger Opiates not at all. Moreover in a painful Cough, a Consumption, Pleurisie, Empyema, [an ulceration in the Lungs] and other pectoral Distempers, that is to say, in all, wherein Nature is inclined suddenly to evacuate that which is troublesome and oppresseth the Breast, and takes a great deal of pains to do it, and that at the same time the instruments of breathing being destitute of a sufficient quantity of spirits, grow weak, and perform their task with labour and difficulty, a man ought to abstain from Opium as much as from the rankest poison: for in such a case Narcoticks increase and fix the weight that should be removed, diminishing the strength of those parts which ought to throw it off.

3. That

2. That Opiates work upon the Bowels ordained for concoction, and other parts of the lower belly, giving them many times extraordinary ease in several respects, I have shewed you before, but that they are not always so amicable and kind to this region, but that they sometimes do it great hurt, is equally easie to prove. For Narcoticks, often taken, are very injurious to that principal faculty, to wit, the desire of Food, or the Appetite, upon which all nourishment and the very root of life depends; in that they very much rebate, and many times totally destroy it. For when the spirits that inhabit the inner coat of the stomach, are stupified or deadened by the opiate particles, so that those nervous fibres, though never so empty, are no more shrivelled or wrinkled up, then all desire of Food ceases, nor do we care to eat; but if meat be offered to our stomach, it is immediately thrown back again, because it is not a delight but a trouble to it. Moreover for the same reason the concoctive power of the stomach is often weakened, and the expulsive motions both of that and the Guts grow dull. For it is a common observation, that slow concoction, and dulness or difficulty of evacuation are the familiar and usual effects of Opiate Medicins.

From hence it will be no hard task to give you some Physical Rules and Cautions concerning the right use of Opiate Medicins; which may be done by observing these four things: that is to say, before you give a Narcotick Medicin, you must consider:

Phar. Rat.
Part I.

3. And what
to the Belly.

Physical cautions
concerning
the use of Opium.

1. What the Patients Constitution is.
2. What Distemper he hath.
3. In what condition the animal spirits are, in respect both of the Animal and Vital Functions. And
4. In what state the Blood and Humours are.

1. As to the first, when an Hypnotick is proper, have a care that the temperament of the Patient, his habit or indisposition of body, or his way and course of living do not forbid the use of it. For example, Those that are of a middling stature, and a firm square body, whose blood is hot, and their aspect lively and sharp, endure this Medicin best, and many times take it with good success; but will use it yet with more security, if they have formerly been accustomed to it: on the other hand it is not so convenient, yea sometimes it is very ill for them that are either too fat or very lean; and likewise for such as have spirits of a thinner composition, which may be easily dissipated, or being of a cold constitution, have soft, lank flesh, and also such as being naturally of a dull, indocile complexion, are in themselves heavy and sleepy Fellows; for to such this makes an addition by increasing the weight of other things, if they have never tried this sort of Physick.

1. In respect of
the Patients
constitution.

2. The nature of the Distemper is sometimes of great moment for or against Opiates. In light cases (according to *Sepralius*) that Physician is a sneaking Fool that draweth them into practice. But in some great cases they are either forbidden or very much suspected. In the Palsie, Swimming of the Brain, Nightmare, Apoplexy, and also in the Orthopnea [a Disease when a man cannot breath unless he sits upright] a Dropsie in the Breast or Belly, upon a Numbness or trembling in the Limbs, in very malignant Fevers, and in the Fits of intermitting Fevers, or the crisis of others, Narcoticks are most commonly forbidden. Moreover in a Cough, attended with a great deal of thick spittle or phlegm, in an Asthma, and all other pectoral Distempers, accompanied with oppression of the Lungs, in the Fits of the Mother, and other convulsive Maladies, they ought not to be given but very seldom, and that not without caution, and the advice of a good Physician. But in a grievous Headach, Catarrhs, the Colick, Pleurisie, ordinary Fevers, Vomiting, the Flux, in Fits of the Stone in the Kidneys, the Gout, and all Pains, Opiate Medicins are not onely allowed of, but we fly to them as divine, and all-healing Remedies.

2. In respect of
the Distemper.

3. But whenever such Medicins are proposed, or fall under our deliberation, we must likewise consider, in what tenor and condition the animal spirits that preside in each part are; for if through the smallness of their number, or being oppressed, they are already weakened, and do not sufficiently display their sails, they ought not certainly to be any more diminished or consternated by such a Medicin. Wherefore whilst the animal faculties, either as to sense, or discourse, are not in good plight, or do not exert themselves so nimbly as they should do; or when the Pulse or Respiration are either too weak or too quick, or more slow than ordinary, or stopped and unequal; or lastly, when the limbs and moving parts are seized with a numbness and weakness, attended with an unusual languishing, we must altogether omit all Hypnotick or sleeping Physick. But we will stick to put it in practice, whenever it is proper

3. In respect of
the animal spi-
rits.

Phar. Rat. in greater cases, and that at the same time the animal spirits, in these and other respects are strong enough, or when they are too much expanded or raised above measure, and grow wild.

Part I.

4. In respect
of the Blood
and Humours.

4. In the mean time the state of the Blood and Humours is not to be neglected; for sometimes the bad or unequal temper of these forbids all Opiates whatsoever, or permits them to be taken but sparingly, and with a kind of restriction. The Blood prohibits the use of them, as it offends either in quantity, quality, or temper. As to the former, the bloody liquor is either too much or too little, and in both respects excludeth all Narcotick Medicins. For first of all, if at any time the blood being too turgent [or swelling] in quantity, and at the same time bubbles up through any feverish heat, distending the vessels to a great extremity, and thereupon the heart endeavours with all its strength to drive it about as swift as possibly it can (lest it should stagnate, or overflow in any part) repeating the turns of Systole and Diastole with all speed, then certainly to give a Narcotick, whereby to hinder the labour and last endeavours of the heart, which are so necessary for the preservation of life, would be the part of a Poisoner, rather than a Physician. Wherefore in a *Pletthora* [or fullness of blood] blood-letting ought always to go before the use of Opium. Secondly, Nor is there less danger in Opiates, when they are given upon a defect or want of blood, as after great hæmorrhages [fluxes of blood] long fasting, or a great fit of sickness: for when the stream of the blood is very small, and by reason of its smallness is scarce continued, the heart endeavours to drive it about very swiftly, and with double diligence, lest the course of it should be interrupted, and it should cease to flow. Hence it is obvious to conceive what great hurt Opiates do, which put a stop or a scratch to this motion of the heart, that is at that time so necessary. Indeed this seems to be the reason, that we forbid Women to sleep soon after they are brought to Bed, and that they bleed very plentifully, as we do any body else, after a great loss or extraordinary fluxes of blood, lest the spirits being recalled whilst the Parties sleep, should forsake the heart, and leave it destitute of power to drive about the stream of blood which is then diminished. Moreover sometimes the Blood being disordered in its quality, or (to speak more properly) in its *Crafsis* [or temper] forbids the use of Opiates; for whilst in an ill habit of Body or a Fever, the Blood being very full of dregs, ought to be agitated and driven more swiftly about with a greater impulse of the heart, that the heterogeneous particles may be subdued and quickly evaporate, the operation of a Narcotick intervening, stops the motion of the heart, and consequently retardeth, and sometimes frustrates the purification of the Blood.

As for other recrementitious humours, that are usually gathered in the stomach and guts they likewise ought to be purged out and carried away by Vomit or by Stool, before the Opiate be given: for otherwise they will fix and stick there more stiff than ever. For the fibres of the bowels being stupified by the Medicin, are not irritated as before, nor do they easily put themselves into, or nimbly perform expulsive convulsions, in order to the discharge of those recrements or dregs: wherefore if any thing be to be thrown out, it must be done before the Narcotick Medicin be taken.

C H A P. III.

The several sorts, Preparations and Receipts of Opiates.

NOW that I have delivered to you the Doctrine of Narcotick Physick in general, and sufficiently explained the Reasons and ways of its operation, my next business is to recount, and particularly to consider those Medicins that are endued with such a quality, both Simples and Compounds, and so to make a kind of Opiological Treatise of it.

First therefore, According to the Method observed by most Authors, I thought it proper in this place to distinguish such Remedies as are called *Anodyna* [Medicins to remove Pain] into two Classes, that is to say, as they are stronger or weaker. For some of them being meerly Narcotick, do not onely force sleep preternaturally, but when occasion requires, procure a freedom from pain and a numbness, and being unduely given, many times death it self. But there are other Medicins said to be of this kind, in as much as when the spirits are heated and in disorder, they entice and kindly compose them to rest, not by destroying or stupifying, but onely by mollifying and soothing of them.

I. To the former sort of these (which are the onely ones properly called Narcoticks or Opiates) we usually refer Poppy both white and red; and some other more venomous things, which for that reason are not to be prescribed. But of some of them that are not so unwholsome, the Roots, Leaves, Flowers, Seeds, and thick Juices, are frequently used, and (as I have before shewn) are often taken with the greatest success. But seeing each of them have some poison mixed with them, therefore you must not prescribe sometimes one sort and sometimes another indifferently, as in the other parts of practical Physick, but trie only such things as are most safe and approved by long experience. Hence custom hath at last so far obtained upon us (from which we may not recede without hazard of mens lives) that Poppy and the Preparations thereof, are the basis or complement of almost all Opiate Medicins. The Seeds of Henbane and the roots and juice of Cynogloss or Dogs Tongue, are ingredients in the compositions of some Hypnoticks; but yet whenever we have a desire effectually and safely to provoke sleep, the whole force of the Medicin is placed in Opium or Diacodium. I shall not need in this place to describe white Poppy, out of which these are made, nor the extraction of the Opiate Juice, or to give you the Composition of that Syrup, because all this is done at large in the Botanical and Antidotary Books [or Books that treat of Plants and Antidotes] both of the Ancient and Modern Doctors. As to what remains therefore, and makes most to our purpose, I will endeavour to shew you the elementary parts of Opium, and from thence demonstrate the virtues of both that and Diacodium, with the reasons why they intoxicate.

The body of Opium may be examined and distinguished, as to its constitutive parts, better when it is entire and untouched, than when it is Chymically taken in pieces: For if it be distilled by fire, then through the plenty of impure sulphur that is in it, it burns horridly, and at the same time sends forth a very noisom stink. But yet it is obvious to sense that there are abundance of sulphureous particles in this body; which also its nasty stinking smell and inflamableness do manifestly declare. And though it be equally certain that there are saline particles joined with this sulphur, and consequently that this body consists chiefly of these two together, with some small quantity of Earth; yet of what nature, and in what state that Salt is, I cannot positively tell; onely I can guess by the effects of it, that this sulphur-saline body is altogether contrary and destructive to the texture of animal spirits, which is spirituous and salino-volatile. And indeed a man may gather from many instances that the Narcotick virtue lies in the sulphur joined with the sharp or aculeate salt, from whence it hath its stinking smell: For of this nature are white Poppy, Mandrake, Henbane, and Tobacco, and other Opiates, all which have an ill smell, almost like one another, which is very offensive to our spirits whilest we smell it. Moreover according as the animal spirits in several bodies are of a somewhat different texture, therefore Opiates work more virulently and strongly in some than in others. *Turks* and *Egyptians*, whose spirits are more fixed and less volatile as being generated out of adust blood, eat Opium without any danger, at least without hazard of their lives; not so of *Europeans*, who have more pure and subtile spirits. Dogs eat Opium in a great quantity without any sleep or danger of death. A very small dose of it kills a Cat

The distinction of Anodyna Medicins.

I. The Roll or Catalogue of all Narcoticks.

white Poppy.

The Nature and Parts of Opium.

In what the Power of Opium consists.

It doth not work the same way in all.

It doth not hurt a Dog, as it doth a Cat or a Man.

Phar. Rat.

Part I.

Some instances
of it.

immediately, because the spirits of that Creature being very salino-volatile, cannot by any means endure the Narcotick sulphur. And hence it is, that one drop of the Oil of Tobacco, put upon the end of this Animals tongue immediately creates Convulsions and a dizziness in it, which are attended with present death. I once saw 3 ij. of Opium put into a piece of Bread and given to a Cur-dog; and a little while after growing very sick he became dull or rather stupid, and by his difficulty and striving to breath, seemed to be just a dying; but afterward within half an hour, he eased himself in great quantity with the nastiest stink that I ever yet smelt, and immediately grew well and lusty. Now that so great a quantity of Opium did not hurt this Creature, the reason proceeded from the extraordinary acid ferment of his stomach, whereby the sulphureous particles of the Narcotick might be rebated and in some measure subdued; and so this sulphur being very much dissolved by the acid menstruum in his stomach, his excrement came forth very foetid or stinking. For we may observe of other bodies, that whilst an acid works upon a sulphureous body, it causes an ungrateful smell: For so it is when *Aqua stygia*, or spirit of Vitriol, is poured upon the filings of Iron. So also when spirit of Vinegar is put to a Lie made with Antimony; and I could tell you a great many other things of this sort. But yet we must not deny but that the particles of the Opium do work upon the spirits of the Dog, which notwithstanding resist the Narcotick poison more stoutly than either those of a Man, or other four-legged Animals; as appears by the Story which I just now told you: for that though a dulness, difficulty and straitness of breath began to arise, by reason that the spirits of the brain were affected or overpowered with a drowsie quality, those symptoms immediately vanished as soon as the Narcotick matter was thrown off by purging. Moreover I knew the truth of this opinion still more confirmed by an Anatomical Experiment. Many years ago I saw about three ounces of the Tincture of Opium, made very strong in Canary Wine, and transfused into the jugular vein of a live dog. When his vein was closed, the Dog ran about as he used to do, seeming to be little or not at all affected with it: but after a quarter of an hour, he began to be a little dozed, to nod his head, and at last to fall asleep: but we having no mind he should, when we had hindered him for some time from it by beating, threatening him, and trying to make him run, at last by that means his sleepy inclination was quite off of him, and he became very sound and lively. From whence it is apparent, that the poison of Opium is either so far subdued within the bowels of concoction by their ferments, or resisted by the animal spirits themselves, that it is not always alike in all Creatures, either sleepy or mortal.

Diacodiatr.

As to the heads of white Poppy, with the seeds of which Diacodium is made, and likewise Decoctions, Emulsions, and other sleepy Confections, it is evident that these are much less impregnated with Narcotick sulphur than the concrete juice of Opium; and that what there is in them of that kind, is much more pure and innocent. Wherefore we very often give Remedies compounded of these with a great deal more security. For we must not go so high as Laudanum, unless when through the vehemency of the symptoms, Diacodiate Medicins will not do the work. Moreover since these have less virulency in them, they do not want much preparation, but may be put to a physical use after plain boiling, infusion, or expression, or squeezing. But Opium is seldom prescribed alone and by it self, but useth to be corrected and compounded with various and different Preparations, that it may be made an Anodynon, safe enough to be taken.

The Preparation
of Opium.

The Preparation of Opium is either Simple or with Dissolvers and Correctors joined to it. The manner of the former consisteth chiefly in this, that the mass of it being cut into several small pieces like Dice, it be exposed to the heat of the Fire or the Sun so long, till the Narcotick sulphur being partly evaporated, that which remains becomes friable [or fit to be rubbed in pieces] and less offensive to the nose; which Preparation of it is usually put in practice before most others. For whether we would make a Tincture, Extract, or Confection of Opium, it is first dried and reduced into a Powder by this precedent means. Moreover to this you must refer the smoaking of it with sulphur, in the same manner as we tame Scammony: for an acid vapour ascending from common sulphur, whilst it flames, doth much subdue or weaken the virulency of both the other sulphurs, both the Purging and the Narcotick or sleepy.

The Opiates of
the Ancients.

There are many and very different Preparations with their adjuncts, or rather compositions of Opium; whereof some have been more usual and famous among the Modern Physicians. But the Opiates of the Ancients which were most noted are *Pilula de Cynoglossa* [Pill of Dogs-tongue] *Requies Nicolai*, and *Philonium*, of which last there are four sorts, to wit, *Romanum*, and *Persicum*, (the use of which is in some measure retained even to this day) and likewise *Philonium Galeni*, and *Philonium Mesuae*.

The

The Descriptions of all these are common enough to be seen in most Antidotaries *Phar. Rat.* [or Books of Antidotes] so that I need not here to repeat them. The reason of these very Anodynous compositions, though it stands upon a false foundation, yet in another respect it is found to be good enough. For upon a false supposition that Opium is cold in the fourth degree, many things which are hot in the same degree, as wild Pellitory, Euphorbium, white Pepper, and the like, are added to the *Philonia*, which have in them a great quantity of it. But they do not subdue the Narcotick sulphur of the Opium and rebate its virulency, because their heat opposeth that coldness (for indeed it is not cold, but rather hot) but those sharp bodies, by being full of volatile salt, are the cause of such an effect.

The Opiates of the Modern Doctors, upon account of the laudableness of such a Medicin, are vulgarly called *Laudana*; and some also because they remove Pain, call them *Nepenthes*. When these were first found out *Renodæus* complained very ingeniously, That there were a company of Quacks started up, who in stead of the known Pills, called *Pilulæ de Cynoglossæ*, give us a Confection of Opium, which they call *Laudanum*, wherewith they promise not onely to procure sleep, but to cure all Diseases. The Quacks (saith he) give such an Encomium of this Medicin, that there is no Emperick, no dull Piss-Doctor, no nor any pitiful Barber but professeth himself a *Laudanist*, or an Admirer of *Laudanum*. Without doubt this Custom, though the worst that is, and most pernicious to humane life, is not yet laid down. For there are yet among us not a Troop or Company, but rather a Swarm of Pretenders to Physick; whereof each one brags of his peculiar *Laudanum*, which they give in every Distemper, or any state of a Distemper without any consideration; and if perchance it happen that the Patient sleeps and wakes again, immediately they triumph and claim some token of preheminance, when oftentimes they deserve a Gallows more than any thing else, in as much as when the Pulse and Breath is dejected by an Opiate unseasonably administered, many times all hopes of a Crisis or a Cure are gone: wherefore whosoever values their life, ought to be admonished to have a special care of those unskilful *Laudanists*.

Nor ought the use of Opiates onely, but much more the Invention and Preparation of them be denied to Empericks and Quacks: for it is the work of a good and learned Physician so to temper poisons, that they may not prove a Venome but an Antidote. Wherefore *Laudana*, which were found out by none but skilful persons who had long experience of them, ought onely to be admitted into practice; of which sort there is enough already received and approved on, so that there needs no new ones to be daily added. The ancient *Laudana* invented by *Paracelsus*, *Crollius*, *Quercetan*, *Hartman*, and other famous Chymists, and described also in most *Pharmacopæias* [Books shewing how to make Medicins] are compounded onely under the form of an Extract; in all which for a foundation there is the tincture of Opium drawn forth with a fit menstruum; to which are added other Tinctures, as of Saffron, Castor, (which *Guianerus* calls the *Bezoar of Opium*) of Species Diambraz, and the like; and so when they are all mixed together, distil them in a Bath, so that the menstruum being evaporated, the remainder be reduced to the consistence of Honey; and in fine, for the compleating of it, put into Magisteries, pretious Powders, Chymical Oils, and other things that are reckoned Cordials: and when the Medicin is thus made up, it is most commonly given in the form of a Pill.

Though these kind of *Laudana* seem efficacious enough, and elegantly made up, yet the Modern Physicians have somewhat altered the forms and made the consistence of them liquid, that they may be the better taken in any liquor. To which you may add, that whereas an Opiate Pill (which was no less famous for doing hurt than good) was a terror to some People, a Dose of Liquid *Laudanum* may be better concealed (if it be necessary, and the Patient be averse to it) and when it is poured into other liquor, may go for a Cordial rather than a sleeping Medicin. And indeed sick People sometimes are too cautious as well as too careless in the use of Opiates, and therefore, as in one case they ought to be admonished, so in another they should be cheated and deceived. For the making of liquid as well as solid *Laudanum*, you must extract the tinctures of Opium and its adjuncts severally, in the same manner; which having afterwards mixed all together, and drawn off the menstrua to the one half, there will remain a Medicin which is of a shining red colour, the Dose whereof is from $\mathfrak{z}\mathfrak{ss}$. to $\mathfrak{z}\mathfrak{j}$.

Concerning these *Laudana* of both kinds, it is of greatest moment with what menstruum the Tincture of Opium is extracted; in so much that this is grown to be a great controversie among some Chymists of no small account, whilst some of them supposing it to be cold, use spirit of Wine; and others on the contrary, to abate the heat of the Opium, dissolve it in spirit of Vinegar, or juice of Citron: now indeed

Laudana, or Opiates invented by the Modern Doctors.

Laudana in the form of an Extract.

Liquid Laudanum.

What is the best menstruum to make Laudanum with.

Phar. Rat. each menstruum is agreeable enough, and one almost as good as the other, so it be reduced to an Extract; but if you give it in a liquid form, there is no better dissolver of Opium than spirit of Wine, impregnated with salt of Tartar volatilized. For this most readily dissolves the mass thereof, receives a Tincture that shines like a Ruby; besides which, it somewhat subdues the Narcotick sulphur, and takes off its noisome smell: for to say truth, salt of Tartar is the best correcter of, or rather Antidote against Opium. Hence that same Empericks Opiate Pill, in which salt of Tartar mingled with Oil of Turpentine is the dissolver of the Opium, is reckoned very good: to which Composition they add Powder of white Hellebore, but not for any other reason, I suppose, than because some men maintain a Paradox [a position against common reason] and say that Venoms when they are tamed become the best Medicins.

The Laudanum of Helmont.

For some few Years last past the use of a kind of Liquid Laudanum hath been frequent; of which *Helmont* is commonly said to be the Author. It hath for its menstruum [or dissolver] the Juice of Quinces put into a fermentation by the Yist of Ale: with which a deep tincture both of Opium and Saffron is extracted, which being strained and aromatized, is drawn off in a Bath to the one half; then part of the remainder is kept for use, and is this Liquid Laudanum: of which the Dose is from 15 to 20 drops. The other part by further Distillation, is reduced into the form of Pills, and given from gr. j. to ij. I have given that liquid Opiate, in dysenterical cases, oftentimes with great success. But my Liquid Laudanum (which I most commonly use) hath for its menstruum, the Tincture of salt of Tartar raised to the highest redness by long digestion: and since the Tincture of Opium extracted by this is the ground of the Medicin, for a Complement I add Saffron, Castor, Cloves, and Lignum Aloes: of this the Dose is from 15 to 25 grains.

2. Red Poppy and the Preparations of it.

2. After white Poppy and the opiate Preparations thereof, I come next to tell you of wild or Erratick Poppy, which hath, no question, a kind of hypnotick or sleepy quality in it, but much more mild and benign than that other; wherefore in some cases it is very suitable, and we may be more secure in the use of it. For this there is a Syrup and a Distilled Water prepared, and to be had in Apothecaries shops, which are often given with success in most continued Fevers, and are supposed to be helpful in the Pleurisie by a kind of specifick virtue, which they have, because they remove pains, and by stopping the Pulse in some measure, depress or cool the feverish boiling of the blood. Moreover out of the Flowers hereof, infused in spirit of Wine, you may draw a Tincture, which among Empericks and good Women is a famous Medicin, and said to be good against a Surfeit by hard drinking. Of which this seems to be the reason, because the spirit of Wine keeps all that is in the stomach from putrefaction, and the Narcotick quality of the Flowers prevents the Fever which is coming upon a man.

Cynogloss and its Preparations.

3. Having done with the Medicins made of Poppy, Mandragoras, or Mandrake, Henbane, Cynogloss or Dogs tongue, and Tobacco, come in the rank of Narcoticks, next before us. Of the two former of which, because they are scarce ever received into the practice of Physick (except the seeds of Henbane); I need not make many words, but Cynogloss, because it breaths, as it were, a soporiferous smell or flavour, doth openly profess its Narcotick nature, and by the beauty of its form, doth as it were, invite us to take it up. For it is a very fine Plant, with soft leaves, of a pleasant green colour, and is crowned with delicate purple flowers. The Powder of the roots thereof is an impediment of, and gives denomination to that ancient and famous Opiate called *Pillula de Cynoglossa*. The Juice of the whole Plant (gathered about the beginning of the Spring) being squeezed out and depurated by close and hot digestion, and then decanted from the dregs, gives you a clear liquor, which is shining red like a Ruby. This may be used either as a Menstruum to compound other Narcotick Confections, or an Hypnotick [or sleepy] Syrup is prepared out of it. Or lastly, being gently evaporated, it is reduced into an Extract, out of which, as out of Opium, Tinctures and Extracts are made with convenient Menstruums [or Dissolvers.]

Tobacco.

Tobacco brings up the Rere of Narcotick Medicins, and justly claims a place among them. For though it be no ingredient in their Compositions, yet the smoak of it taken through a Pipe, produces many times the same effect as they do. Yea, which is more to be admired, it doth not onely procure sleep alone, but sometimes also the contrary of it, which is watchfulness. I need not trouble my self to tell you the original or usage of this invention, which is so commonly known and practised by men and women of all sexes, ages, and conditions. The reason why I put it in the number of Opiates is, because it works almost the same effect among our Countrymen, as Opium doth among the Turks: for both of them dispose men to do or suffer any thing (by affecting the animal spirits with a kind of unusual motion, and rendering them as it were astounded) without any great sense of pain or weariness. Wherefore

to the smoak of Tobacco taken in at the mouth, according to the common custom, they ascribe not onely many, but different, yea contrary virtues and effects, that are repugnant one to another. For it is vulgarly said to heat us when we are cold and chill, and to cool us when we are hot; to procure or prevent sleeping; and likewise to satisfie or excite hunger and thirst: the reason of all which, consists in this, that the animal spirits being gently agitated, and as it were put into a kind of Dance by this exhilarating fume, are totally deaf to the molestations of any troublesome object; yea, whatsoever of difficulty they have to do or suffer, they perform insensibly and without any disturbance. Whereupon the use of Tobacco is not onely good, but almost necessary for Souldiers and Seamen, where it agrees with them, in as much as it makes them both undaunted in all dangers, and able to endure hunger, cold, and labour. But that this smoak is very Narcotick and injurious to the spirits (before it grows familiar to them by long usage) is manifest from this, because when they first attempt to take it, there is hardly any one but suffers very great disturbances in their Brain and Nerves. For when a man is initiated in this dry kind of drinking, he is immediately taken with a swimming and a cloudiness in his Brains, which is often attended with vomiting and purging; their feet fail them, their hands tremble, and their tongue stammers, or talks idly. Many times also a cold sweat and terrible fainting fits ensue thereupon, the cause of all which is, for that the animal spirits, being as it were intoxicated by the Narcotick sulphur, are in their whole Government very much distracted, and forced into disorders: nor onely at the first or second bout, but from the beginning it is many times a long while before the smoak of Tobacco can be taken without great confusion in the spirits. But as soon as that custom is become usual and familiar to a man, it likewise grows very grateful, and affects the animal spirits with so much pleasure, that some men had rather abstain from meat or drink than from the use thereof. The reason of which is, because this smoaking doth gently raise, and as it were tickle the animal spirits whenever they are dull and sluggish, and puts them into pleasant expansive motions, with which they are recruited and refreshed in a wonderful manner, as after drinking of Wine.

So much for the principal Narcoticks with their Preparations, and the manner of using them, who belong all to the family of Vegetables. But lest it should be thought that Minerals are of no effect in this case, some men will tell you, that even out of those harder bodies they have prepared most excellent Opiates, without any Opium at all in them. *Quercetan* prescribes the making of a certain *Nepenthe* [Pain-removing Medicin] (which is very efficacious to allay and take off all pains and languishings) out of the Narcotick sulphur of Vitriol, and Oil of Sol and Luna [i.e. Gold and Silver] with Tincture of Coral, and other famous Cordials: of which Medicin I am so far from admiring the Virtues, that I rather think, that either there are no such metallick sulphur and Oils at all, or that they are of little or no force. Therefore contemning those things, and returning to the genuine and real Narcoticks, I will for a farewell, subjoin some forms of them, which I will likewise digest into several Classes or Orders, according as the Opiates have for their ground either the Syrup or Distilled Water of red Poppy, or Diacodium, or Laudanum in an Extract, or Liquid, or Pills of Storax or Cynogloss, or a Philonium.

Phar. Rat.
Part I.

The effects of
smoking it.

And the reasons
of it.

The grounds of
Narcoticks.

Take of red Poppy Water, and Cowslip Water, each \mathfrak{z} vj. of Syrup of Rhead Poppy \mathfrak{z} ij. of I. water and
Sal Prunella \mathfrak{z} β . mingle them and make a Julap. The Dose is \mathfrak{z} iij. or iv. thrice a day, Syrup of Rhead
in a Pleurisie, Pains and Watchings, without any Fever or manifest cause. Poppy.

Take of Poppy Water \mathfrak{z} iv. to vj. and let it be taken sometimes by it self twice or thrice a day for the same intentions.

Take of Diacodium from \mathfrak{z} β . to \mathfrak{z} vj. of Cowslip Water \mathfrak{z} iij. of Treacle Water \mathfrak{z} iij. and Potlond
make a Potion.

Take of Carduus Water \mathfrak{z} iij. of Diacodium \mathfrak{z} β . of Spirit of Harts horn, from \mathfrak{D} β . to \mathfrak{D} j
and make a draught to provoke sleep and sweating.

Take of Diascordium \mathfrak{z} β . of Gascoign Powder \mathfrak{D} j. of Diacodium \mathfrak{z} ij. mingle it, and let
the Party take it in a spoon.

Take of Diacodium \mathfrak{z} iij. of Snail Water \mathfrak{z} j. and mingle them. It is good in a Cough and
Pthiick. The Dose is one spoonful when you go to Bed, and if need be, repeat it after
midnight.

Take

Phar. Rat.
Part I.2. Laudanum
extracted.
Pills.

Take of London Laudanum gr. j. of Powder of Claws compounded $\mathfrak{D}\beta$. to $\mathfrak{D}\mathfrak{j}$. with a convenient quantity of Syrup of Clove-gilliflowers. Make 3 Pills to be taken when you go to Bed.

A Bolus.

Take of Laudanum gr. j. to gr. j. β . of Diascordium $\mathfrak{D}\mathfrak{j}$. make a Bolus. In the room of the Diascordium you may put Confection of Alchermes, or of Jacinth.

A Draught.

Take of Laudanum gr. j. dissolved in a spoonful of Treacle water, and put to it of Cowslip water $\mathfrak{z}\mathfrak{i}$. make a draught.

3. Liquid Lau-
danum tartari-
zed.

Take of my Liquid Laudanum tartarized xx. drops, and give it in a spoonful of Aqua Mirabilis or Cinamon water, or any other that is fitting. It is good in pains of the Colick, Stone, or Gout.

Take of Species Hieræ $\mathfrak{z}\beta$. of the same Laudanum xx. drops, and make iv. Pills, to be taken when you go to Bed to purge, and likewise to allay pains in the Colick.

4. Liquid Lau-
danum prepared
with Quinces.

Take of Liquid Laudanum prepared with Quinces, from xv. to xx. drops, and give it in a spoonful of small Cinamon water, in dysenterical Diseases.

Take of the Conserve of red Roses $\mathfrak{z}\mathfrak{j}$. of Treacle of Andromachus and the Confection of Jacinth, each $\mathfrak{z}\mathfrak{i}$. of red Pulvis Pannonicus $\mathfrak{z}\mathfrak{j}$. of Laudanum prepared with Quinces $\mathfrak{z}\mathfrak{i}$. of Syrup of Coral, a convenient quantity, make a Confection. The Dose is $\mathfrak{z}\mathfrak{j}$. every four or five hours, in a very bloody Dysentery [or Flux] with gripings.

5. Pills of
Storax.

Take of Pil. de Styr. [or Pill of Storax] gr. v. to vj. of Lac Sulph. $\mathfrak{D}\beta$. of Oil of Anise seeds j. drop, of Balsam of Peru a convenient quantity, make iv. Pills to be taken in a Cough, Asthma, &c.

And of Cyno-
gloss.

Take of Pills of Cynogloss gr. vj. to viij. make 2 Pills to be taken at bed time for the same end.

6. Philonium.

Take of Philonium Rom. $\mathfrak{D}\mathfrak{j}$. to $\mathfrak{D}\mathfrak{i}\mathfrak{j}$. of Conserve of Clove-gilliflowers $\mathfrak{z}\beta$. mingle them; make a Bolus to be taken when you go to Bed. It is good for the Colick, in a cold temperament.

After Narcotick remedies, which I have now sufficiently exposed to their view, I should in the next place say something of Medicins that are merely Anodynous; that is to say, such as gently quiet and compose the animal spirits when they are any way disturbed, or in an heat, not by subduing or stupifying, but onely by mollifying and soothing of them. But the *en* of these (*i.e.* whether there are any such in nature or no) ought first to appear, before we form a Discourse of the *Non* [*i.e.* why they are so.] For besides that Fomentations, Pultises, and Ointments outwardly applied, and Clysters injected into the Guts do sometimes allay pain, I know no other effect that is performed by those merely Anodynous Medicins, at least when they are taken in at the mouth. Wherefore I do not think it worth while to frame any reasons for such, because we cannot at all rely upon them for procuring of sleep, or easing of pain, when it is very sharp upon us.

Medicins that
hinder sleep.

But seeing we have hitherto discoursed so largely of Opiates, with their Preparations, and the ways how they work, according to the former method, I should now in order speak of such Medicins as are contrary to them, or Anthypnoticks; that is to say, such as by keeping sleep off, when it comes too fast upon us, make us watchful; if I had not formerly performed this task in almost all particulars, in a Discourse concerning the Brain (where I treat of the Lethargy and other sleepy Distempers, with their Remedies) so that there is no need for me in this place to repeat the same thing over again.

Coffee, and its
Effects.

But since in that Book, and also in other places, I have made frequent mention of a certain liquor called Coffee, which is very effectual for the expelling of drowsiness, I do not think it altogether improper to add some few words more in this place concerning that Drink with its effects, and the reasons of its operations, which I have hinted elsewhere. It would be besides our purpose here to discourse of the ancient and common use of it, now among the Turks, and formerly among the Arabians and other Eastern Nations; but seeing that this Drink hath been used even by our Country-men too, for some years last past, and almost every body knows by experience what great virtue it hath in driving away drowsiness, therefore let us now inquire into the reasons of this so well known and tried effect. The reason of this I have told you in the

Chapter *De Pervigilio* [of Watching] consists in this, that the Coffee insinuates adust particles (wherewith you may know by smelling as well as tasting, that it abounds) immediately into the blood, and then into the nervous juice; which particles do by their disagreeableness, and also by their restlessness, not onely keep the pores of the outward Brain still open, but likewise give such spurs and provocations to the spirits, (which are disengaged for all bonds of drowsiness besides) as may excite them still to perform their offices: for to procure sleep these two things are necessarily required, of which sometimes the one and sometimes the other is most effectual: that is to say, all the pores and passages of the outward Brain or the Cortex of it, must be very much stuffed and filled with a Liquor that distills as it were from the blood, and flows into those parts; and by that means be closed up; and then afterward to produce that effect, it is necessary that the animal spirits being excluded out of those pores and passages, and also many times clogged with nutritive and serous particles, should betake themselves towards the middle of the Brain and lie idle. In these Preparatives to sleeping, there is not always one and the same order. For sometimes the animal spirits do first and of their own accord forsake those places, whilst the nervous juice immediately runs into them when they are emptied; and sometimes the nervous humour that flows thither with the serum in great plenty, gets into those passages first, driving the spirits out of them even against their inclinations, and forcing them inward.

But the operation of Coffee seems contrary to both these effects: For immediately after the drinking of it, the adust particles, which are extraordinary active and nimble, being conveyed into the blood, do somewhat dissolve the liquor of it; and separate the serous part toward the reins and into the habit of the body; and then those particles coming to the Brain, do very easily open the pores of it, and keep them also by their restlessness very wide. Afterward being joined to the spirits, they strip them of all other particles that either oppress or are nutritive, and consequently put them, being now light and volatile, into several motions, and cause them to be expanded through the whole circuit of the Brain, which is freed from all opplenion [fulness] and obstruction.

But in the mean while, when the spirits being exercised in this manner continually and indefatigably, are deprived of the access and assimilation of the nervous juice, their forces are not sufficiently and in the usual manner recruited. Indeed the old Spirits are made more active and nimble, but the supplies of new ones are diminished. So that it appears from hence, that this drink though very common in use, and in some cases very beneficial, and extraordinary physical, yet in some others perhaps is noxious or less wholesome. And that it is so, not onely reason but daily and common observation tells us, in as much as Coffee-drinkers, that take it to excess, become many times lean Fellows, and subject to the Palsie as also averse to, or unfit for Venery. The former effect is so frequent and well known, that I have for that reason alone forbidden a great many to drink Coffee, because it makes them grow lean.

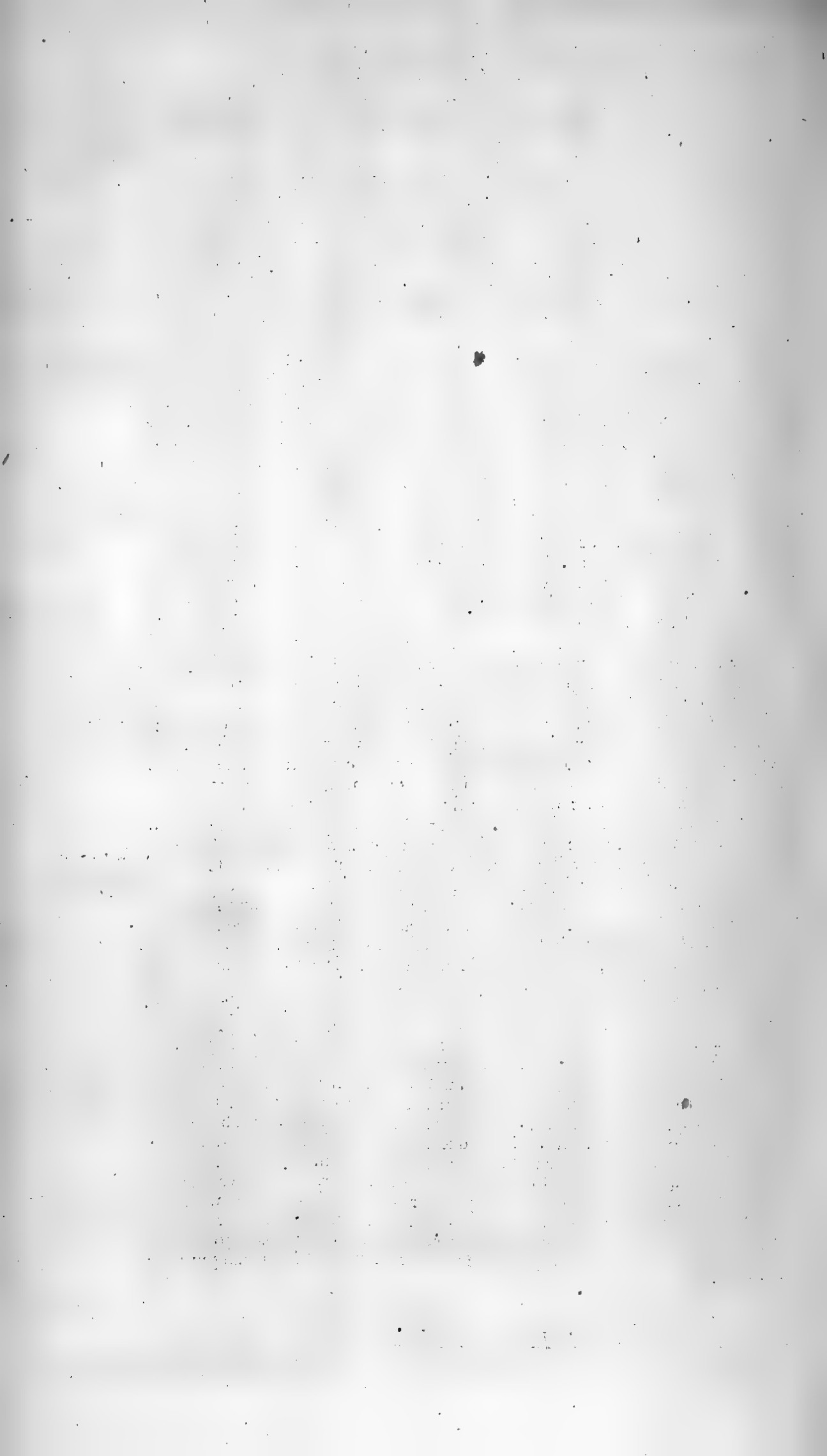
For seeing the blood, by the daily and too frequent use thereof, becomes sharp and more heated or dried, it is therefore less able to nourish. But as to the indispositions of the Brain and Nerves, I think I sometimes prescribe this Drink, for the curing of them, as much as any man: for I use to send some of my Patients to the Coffee-houses rather than to the Apothecaries shops.

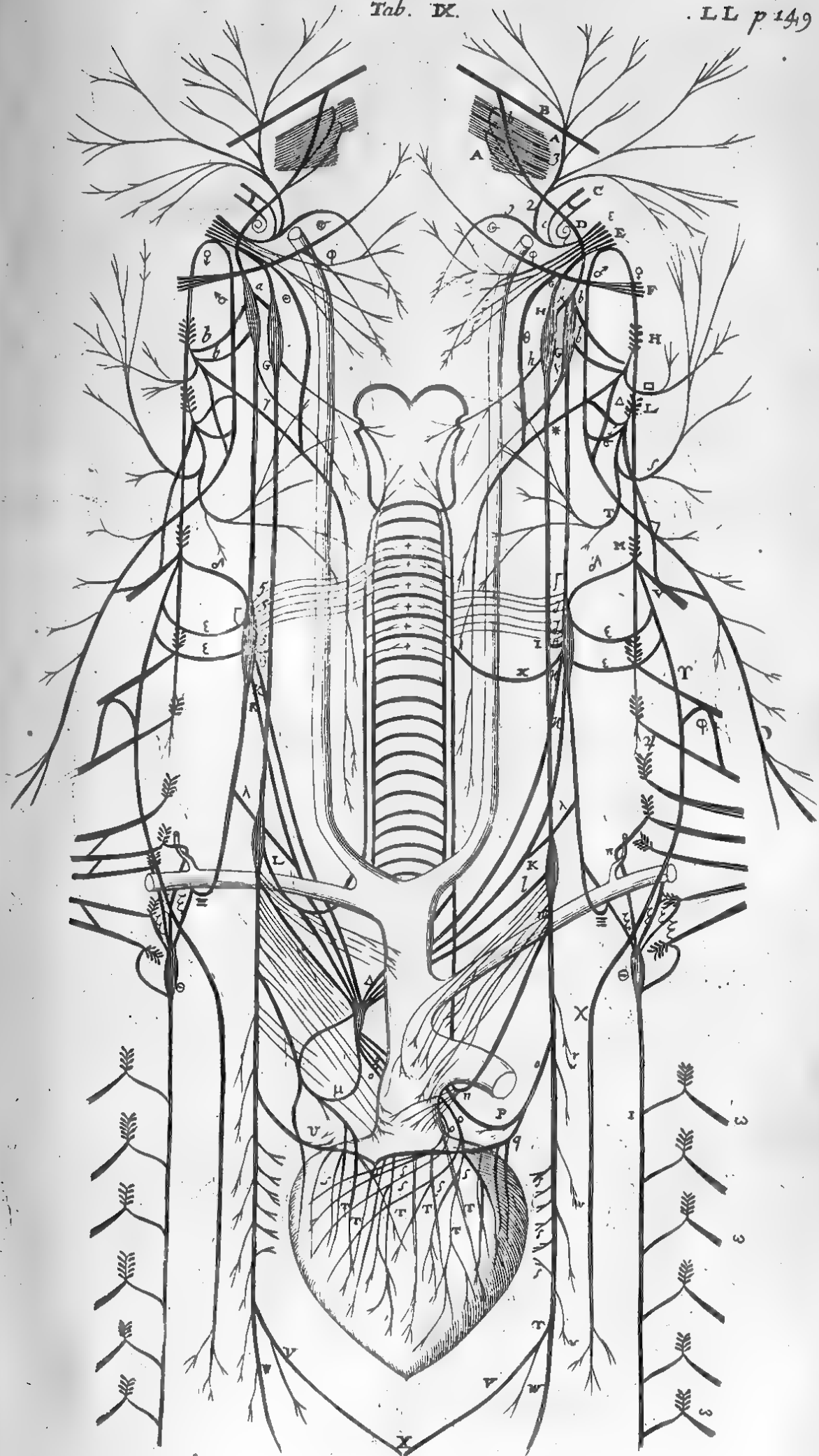
Indeed in most diseases and maladies of the Head, as the Head-ach, Swimming, Lethargy, Catarrhs, and the like, where there is a moist Brain, but a dulness and numbness of the animal spirits, joined with a full habit of Body, a cold or not an hot constitution and watery blood, Coffee is taken many times with great success: for being daily drank, it wonderfully clarifies and illustrates or purges the Brain, and dispels all the clouds from off every function whatsoever: but on the contrary, such People as are thin, cholerick, or melancholick, and have sharp and hot blood, an hot brain, and their animal spirits too much disturbed and discomposed, ought altogether to abstain from this kind of Liquor; because it the more perverts both the spirits and humours, rendering them unfit and unable for any functions whatsoever. For I have observed many People that have had no great plenty of spirits, and likewise such as were subject to the Headach, Swimming in the Brains, Palpitation of the Heart, and trembling, or numbness in the limbs, that have immediately been the worse for drinking of Coffee, in those respects, and have thereupon presently felt an unusual languishing in their whole Body.

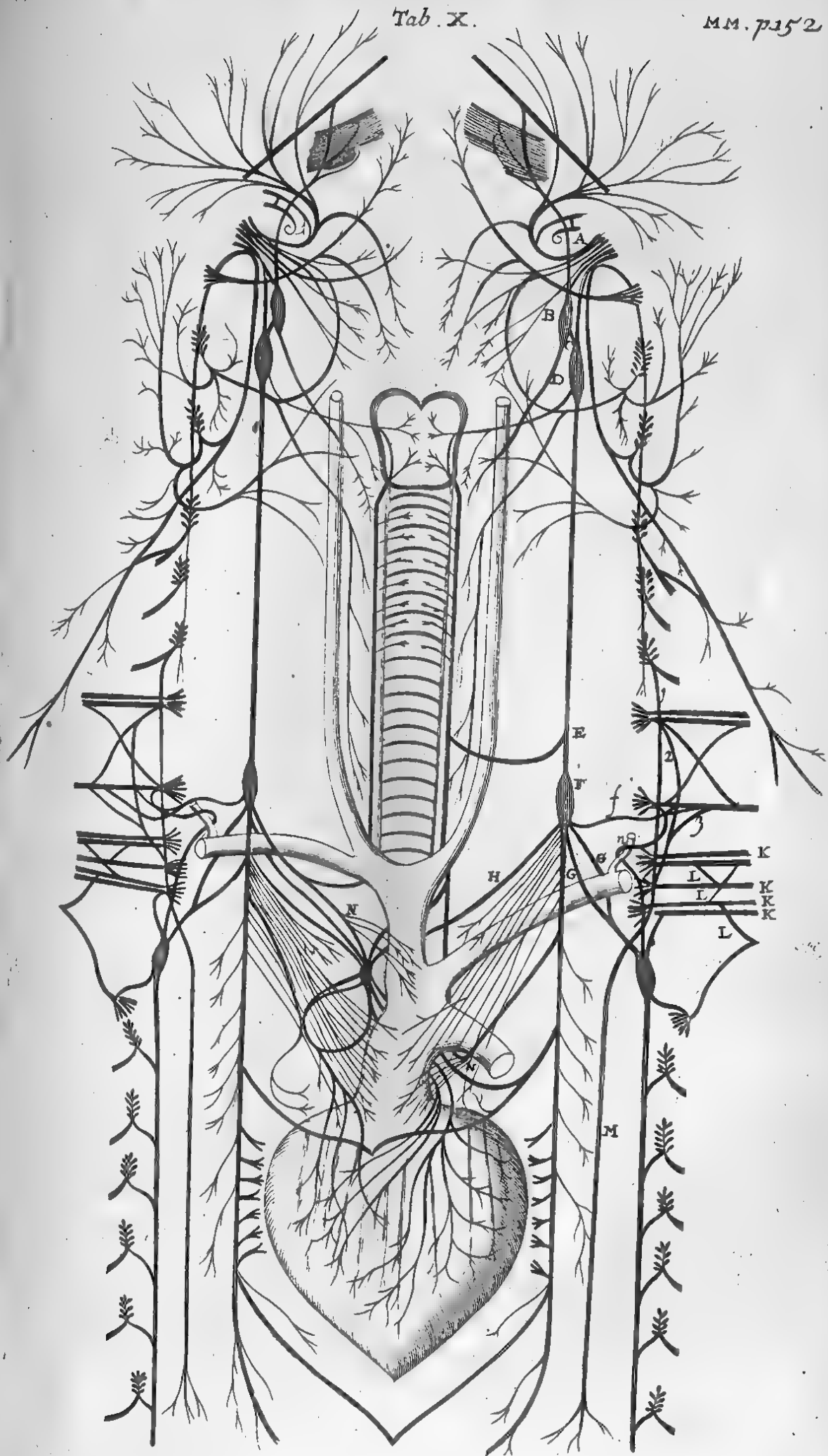
Phar. Rat.
Part I.

*Its conveni-
ces and incon-
veniences.*

*It makes People
lean, and Pa-
ralytick, &c.*







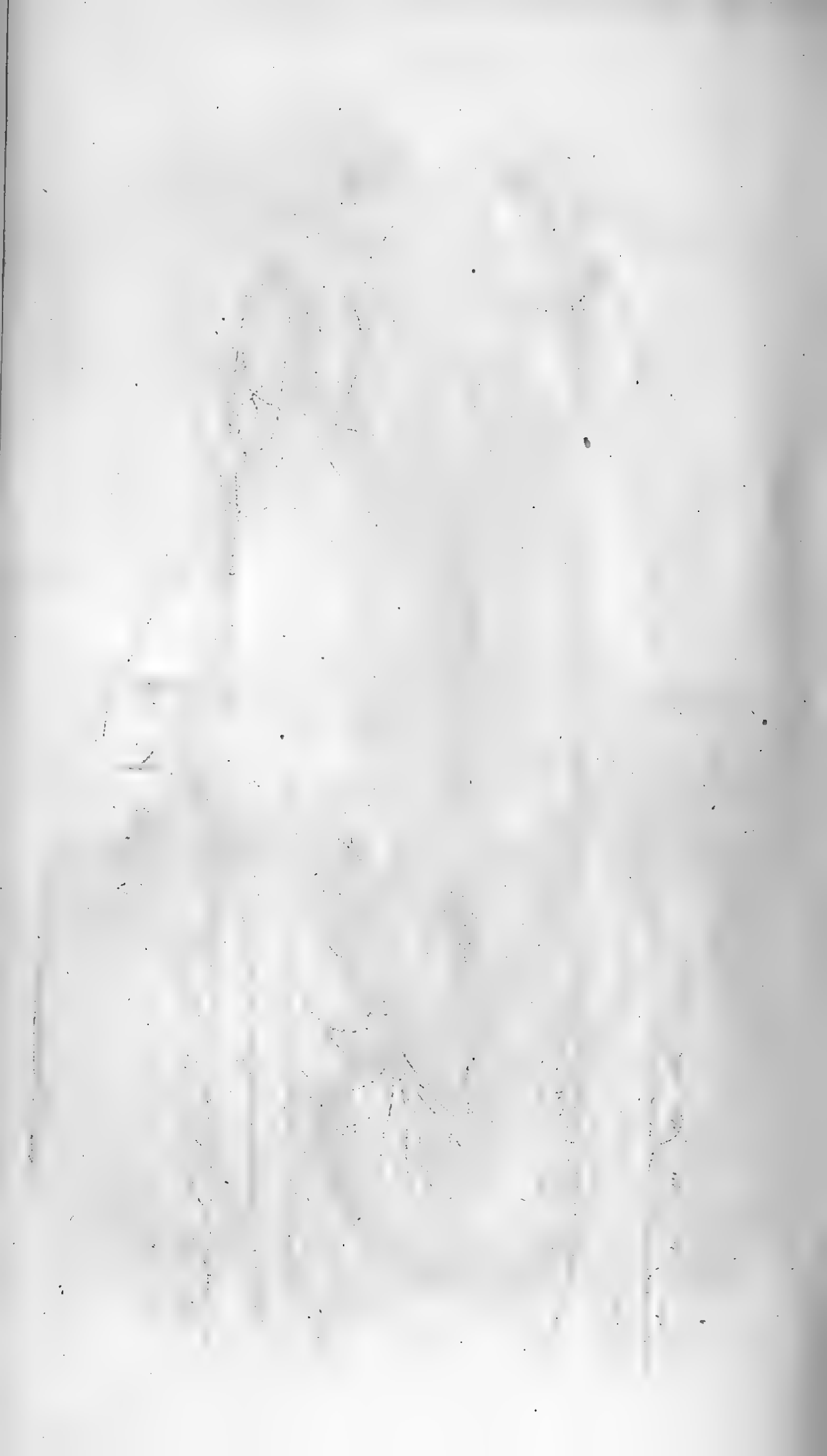


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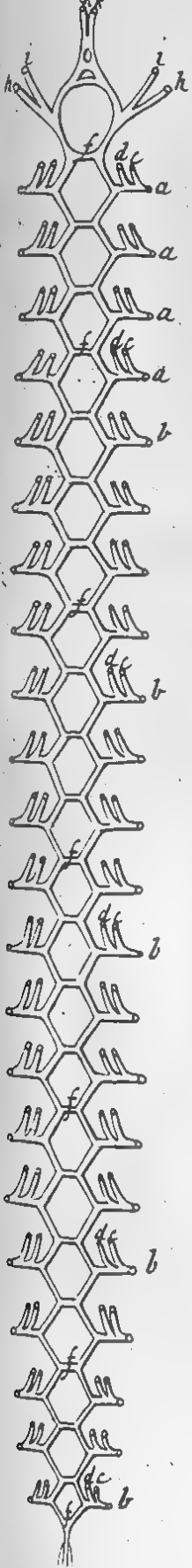


Fig. I.

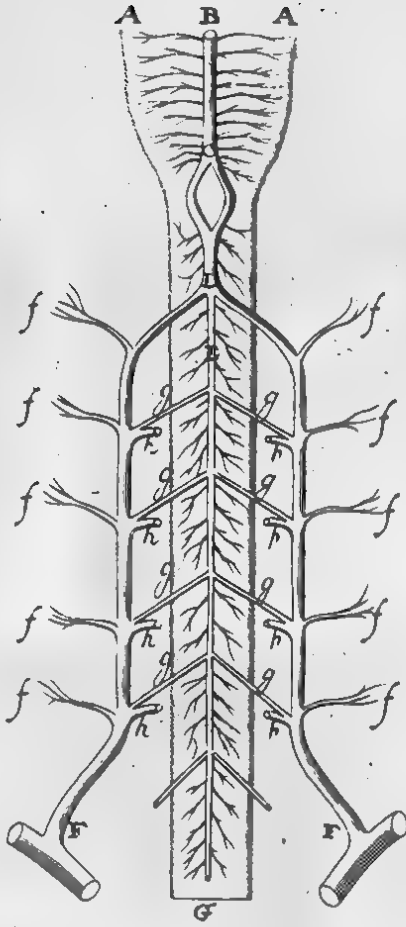


Fig. IV

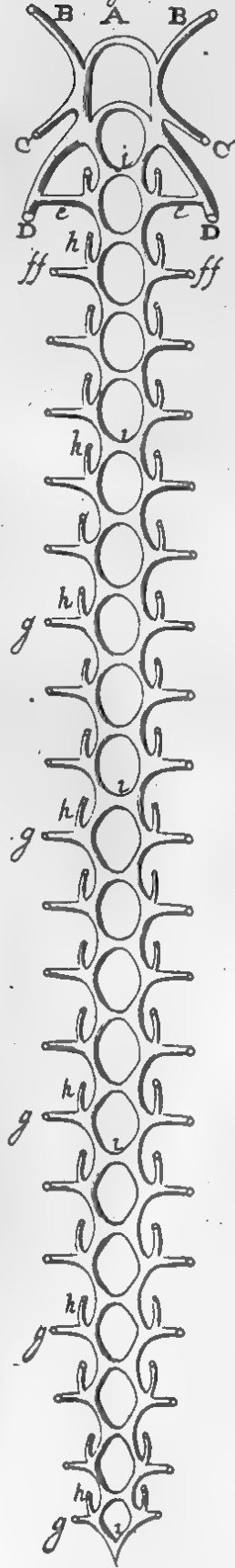


Fig. V

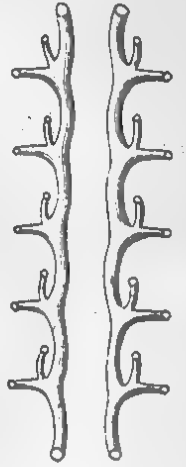
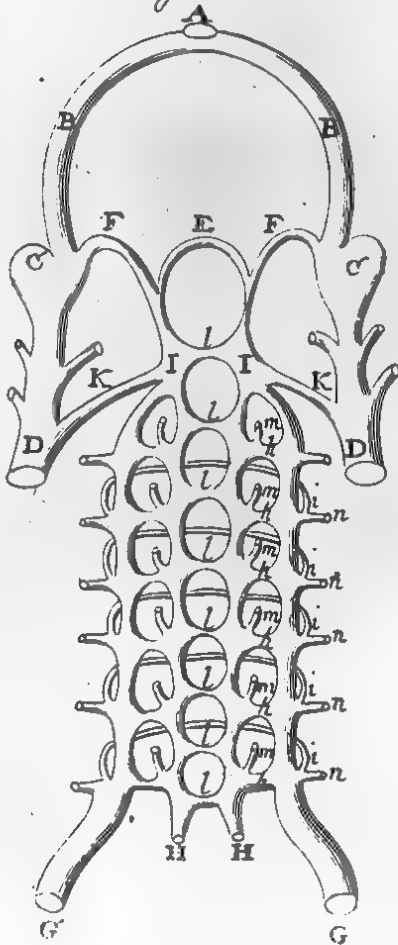


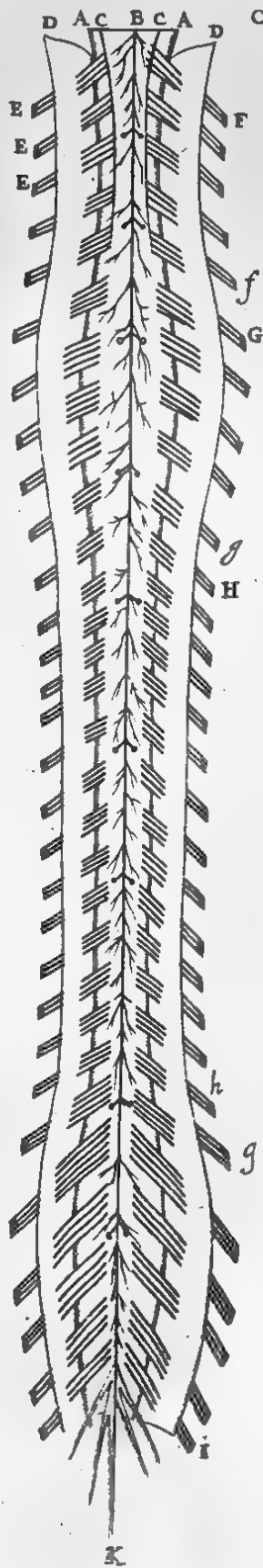
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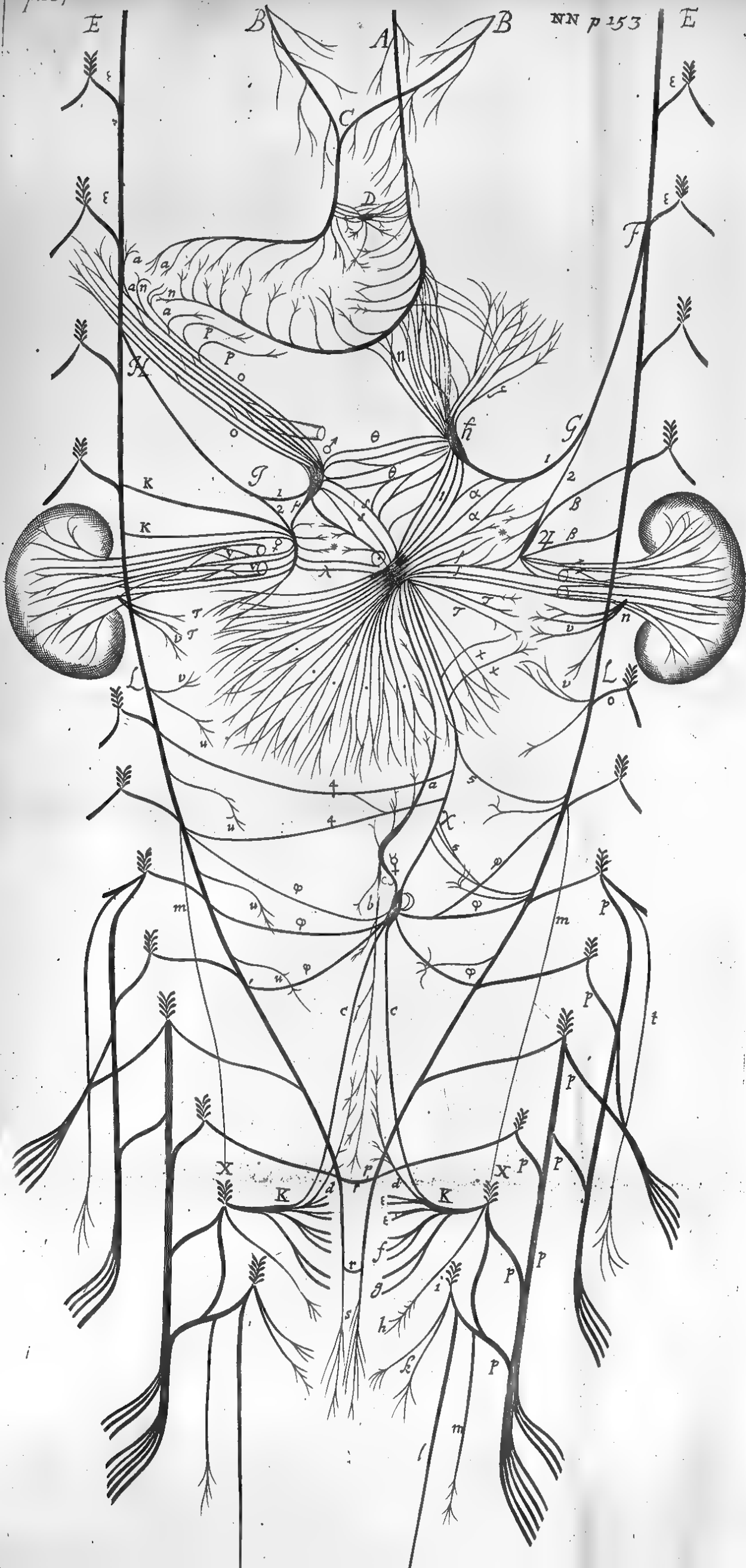


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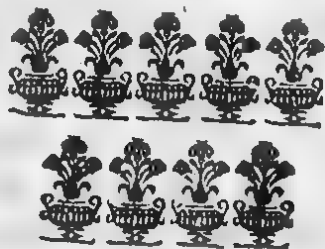
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PHARMACEUTICE RATIONALIS:
OR, THE
OPERATIONS
OF
MEDICINES
IN
Humane Bodies.

The Second Part.

With Copper Plates describing the several Parts treated of in this Volume.

By *THO. WILLIS*, M. D. and *Sedley* Professor
in the University of *OXFORD*.



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UNRECEIVED

REPORT

ON THE

PROGRESS

OF THE

WORK

OF THE

COMMISSION

ON THE

STATE OF

THE

THE P R E F A C E TO THE R E A D E R.

Since first I began to consider the Operations of Medicines in humane Bodies; and their manner of working, and for some time meditating upon the entire Subject, at length published an Essay of the Rational Curatory part; I became affected with so vehement a desire of farther prosecuting that Speculation, that in all spare hours, (to wit, as frequently as I might be vacant from my practice) I could hardly intend or admit thoughts of any other thing: And that not so much that I might please others, as by often turning in my mind, and writing my Meditations of this Subject, I might be better instructed to prescribe to my Patients. For certainly the not duely weighing the Reasons by which Medicines operate, renders all Physick to be Empirical, and to be governed rather by Chance or Fortune than by Advice; and it frequently comes to pass, that a Medicine rashly administred, is but casting a Die for a Mans life. Wherefore, that I might satisfie my self, and practise Physick (as is usually said) with a safe Conscience, it pleased me to bestow more labour in the search of the true Reasons of physical Energies and Efficacies. And because in this Treatise, we chiefly consider Medicines, respecting certain private parts or Regions of the body, and their proper Diseases, therefore we have endeavoured in the first place to perform these three things; viz. First that a most accurate Anatomical Description might be given of the parts, (if not already extant) whose Distempers and Remedies are treated of, as to the Fabrick and uses of all their Vessels. Wherefore, turning over the Breast and Lungs, and most diligently viewing their inward recesses and apartments, what thing soever observable either the Ancients or Moderns have published about these, and whatsoever further by Knife or Microscope we have detected, we have here set forth. In which task, as formerly in some others of the same nature more exactly done, I must confess I owe much to the sedulous labour of my most learned Friend Dr. Edmund King, and

The Preface.

to his most dexterous Dissections. And really I esteem it so necessary to lay the History of the Parts, as a foundation to our Rational Curatory Method, that without it I did believe the whole Superstructure would be meerly phantastical and altogether unstable, or at least unprofitable. For surely, either to practise Physick, or demonstrate its Operations on humane Bodies, without an exact knowledge of the parts and passages, on which, and by which they work, would seem equally absurd, as if a Philosopher ignorant of Mechanical affairs, should go about to unfold and explicate the Artifice and cunning Workmanship of a Clock moving of it self, according to the Theory of Natural Motion delivered by *Aristotle*. Wherefore we have view'd with most exact diligence, in the first place, the Subjects of Physick, or the places of Operation in our Bodies, as the Circuit in which we are to move. Then secondly we have not been less solicitous, that according to the Phenomena of all parts lately detected by Anatomical observation, the true and real Hypotheses of Diseases should be build, whereof we have designed the Remedies; that not still persisting in the thread-bare paths of Ancient Physick, by a certain blind and implicate obsequiousness, after the manner of Beasts, according to the proverb, to be only guided by our Ancestors footsteps; but deriving the Causes and formal Reasons of Diseases from their very Springs, we every where endeavour to shew, from what Disposition of Blood and Humours, from what affection of Animal Spirits, from what habitude of Fibres, and of other solid parts, every Disease proceeds. And these things so premised, and laid instead of a solid Foundation, at length in the third place, that the structure of our Curatory method being rightly compacted, may happily rise up and firmly consist, we have gathered together most of the Medicines respecting most of the private parts and regions of the body, and the peculiar Distempers thereof, *viz.* both Simple and Compound, both Old and New, both Dogmatical and Empirical, gathered out of the Physick-books of every Age, as also those chiefly celebrated by Quacks and Nurses; more choice forms of all which, or at the least the chief of them and manner of using, we have aptly assign'd, and annex'd the reasons as to the Preparations, as also the Operations and Effects of them. But that all is not comprehended in this Tract that was omitted in the former, which yet I had hoped might have been, happens from the plenty of matter, and the bulk of the work encreasing upon our hands: For assuredly, it is more than the task of one Man or Generation, to exhibit a compleat Curatory Method, and absolute in all points. For if this Disquisition were more fully instituted as to its Latitude, not only all the *Materia*

The Preface.

teria Medica (which is almost infinite) but also the whole Body of Physick offers it self. Wherefore these our Attempts court not the name of Treatises, but of Essays. Truly it will not be needful for many Physicians, especially those who neglect the Phenomena of Nature, being intent only on their Practice and Gain, to be learned about the Reasons of all Remedies: but to the genuine Sons of Art, this will be of value, if not to direct, at least to incite them to the Knowledge and serious weighing always of those things they take in hand. And if these small endeavours shall instigate others better to polish that Study, whatsoever Reviling I may reap from the malevolent and envious, it shall never repent me of my labour. For when I shall be well conscious to my self, that I have not suffered my Faculties although small (as the Talent entrusted with me by God Almighty) to perish through sloth, nor suffered them to be buried in the earth, but that they may be rendred with some Interest beside the Principal, it will much please me, nay, I shall seriously rejoyce and triumph.

POST-

POSTSCRIPT.

WHile these were Printing, the most sad message arrives, that the Author, most worthy of Immortality, oppressed by the irresistible assault of a Pleurisie, is departed from among the Living; neither did the Arts profit their Master, which did all others. The Reader will pardon us, if we for a little space celebrate the Funeral of so Sacred a Memory, nor esteem it superfluous to hear in a few words, what manner of person he was who wrote such things: yea he will rejoyce to understand that he was equally Good as Learned, that he also exercised himself in the Practice of Piety, who was most conversant in that in Physick.

The matter requires a just Commentary, but we shall briefly propound what at first came into our sudden thought, while our mind was surprized with so unexpected an Accident.

Extracted from an honest Family, he had a Father educated in ingenuous Studies, who after he had gone Master of Arts in the University of Oxford, being taken with the retiredness of the Countrey, repaired to a Possession he had near the same City, and solely attended his Domestick Affairs, and maintenance of his Family: being enough deserving of the World, who begat such a Son. But He, the Civil War raging, being snatcht away by the Contagion of a Camp-Feaver, left his Son an Orphan, near about twenty years of age, placing the first Rudiments of his Studies in Christ-Church, who being called to take on him the care of an Inheritance, for some time remained in the Countrey, but harrassed by the Incursions of the Rebels, who were possessed of a Garrison strong enough Five miles from thence, and every where Plundering, he betook himself again to Oxford, being the Tents of the King as well as the Muses; where listing himself a Souldier in the University Legions, he received Pay for some years; until the Cause of the Best Prince being overcome, Cromwell's Tyranny afforded to this wretched Nation a Peace more cruel than any War. From thence, the Church being trampled on, and Divinity together with Divines suppressed, he applied himself to the study of Physick, in which, in a short time he made eminent progress. In the mean time being nevertheless addicted to the study of Piety, (whereof it was a considerable demonstration, that when the Liturgy of the Church of England was thrust out of the Church, and none could be present scot-free at those holy Offices after the ancient manner) he entertained Religion then a Fugitive; and allotting part of his House for Holy uses, brought it so to pass, that Assemblies, and Publick Prayers, and other Offices of Piety were constantly performed according to the Rites of the Church of England. In the mean time he writ and published those most excellent Tracts by which he first became known to the World, viz. Of Fermentation, of Feavers, and of Urines.

At length the King restored, and access opened to University Degrees and publick Employ, he proceeded Doctor, and was publicly declared Professor of Natural Philosophy, which Profession he did adorn with the highest praise; Moreover, his Anatomy of the Brain, and his Treatise of the Sourvy, and of Convulsions, were published.

But about the Year 1667. being called to London to practise Physick, it is incredible to relate, how soon, and with how great Commendations he grew famous, especially being so composed by Nature and Custom, that he could not recommend himself by words composed to deceive, or the cunning Arts of Mountebanks. But though he spent whole days and nights in care of the Sick, he was yet at leisure to adorn his Art by composing Books, from whence among a thousand Interruptions he published these Treatises, of the Accension of the Blood, and of Muscular Motion, of the Soul of Brutes, of the Diseases of the Brain, and the first part of his Pharmaceutice Rationalis, and at length the other which we now present. All which, with the Author's Animadversions, and writings unpublished, being collected into one Volume, and committed to the care of the most faithful Apothecary Mr. J. Hemming, we hope some time to print here.

Moreover, the same care for Divine Worship was still impressed on this most Pious Soul; and since he could not be present, by reason of Employ, at the Canonical Hours at the Publick Devotion in the Parish Church where he dwelt, he procured the Sacred Offices of the Church to be there celebrated early in the Morning and late in the Evening, and for the most part was constant at them, whatever Business was repugnant. And seeing this Institution profitable to many in the Neighbourhood, who were likewise all day detained about Commerce and Trades, he endowed a Priest with a fit Salary at his Death, to discharge that Function for ever.

But small was this proof of his excellent Pious temper. Although no Person more frugal and attentive to his employ, yet none more munificent, denying all things to himself, yet denying nothing to the Poor and helpless. Besides what bestowed with his own hands, he provided Almsgivers and Dispensers of his Charity every where in the City, Countrey, and in the University. I speak what I know by frequent experiment; one might easier have received from him, for a fit object of Charity, an hundred Crowns, than have extorted as many farthings from most others. And though any one might justly impute the large Revenues he acquired, to his indefatigable Diligence and constant Frugality, yet I believe it rather to proceed from his bountiful Largesses, and the Divine benediction thereon. From the beginning of his Youth to the last period of his life, he was Master of no summ of Money which he accounted his own, until he had consecrated some considerable Portion of it to God and the Poor: and when a few days before his last, which I must ever lament, we conferr'd together, (as if he had foreknown his approaching Death, and being more solicitous about the Poor than his own Off-spring,) he diligently advised about stating these Accompts.

Postscript.

I omit here to decipher, how undisturbed he was in Adversity, and how temperate in Prosperity; how modest in the highest Fame for his Learning; when unworthily provok'd, how prone to forgive Injuries; how faithful to his Prince to his death; how obedient to the oppressed Church; how candid and ingenuous in the Profession of his Art; how indefatigable his Studies, how sparing in his Speech, and how much a Christian in the whole state of his Life. To finish all which according to his deserts, is not the work of one hour or Paragraph. In short, he was constantly exercised in Prayers, Studies, Labours, Almes, and Watchings; at length being near Fifty seven years of Age, in the beginning of November he seemed troubled with a Cough (now the Epidemical Disease of the time) which (while it was thought light and inconsiderable) suddenly passed into a Pleurisie and Peripneumonia. And when this most expert Person was not relieved by frequent Bleeding and diligent taking of Remedies, himself perceived the Period of his Life to approach, (his Friends hoping better;) and after three days his Household affairs being settlad, and having taken the Viaticum of the Holy Eucharist, and being received into the Peace of the Church, he commended his pious Soul to God, having his senses entire to the last breath, and finisht his most exemplary Life with the like Death.

THE
SECOND PART
OF
PHARMACEUTICE RATIONALIS,
OR OF THE
OPERATIONS
OF
MEDICINES
IN
HUMANE BODIES.

SECT. I.

Of the Medicines of the Thorax.

CHAP. I.

Of the Organs of Breathing and their Use.

IN the former Treatise having essayed to explain the reasons of every Medicine, for the most part we have toucht only upon general Medicines, namely which excite some Evacuation, or recreate and restore the fainting Spirits, or calm those which are too much raging and unquiet : But moreover there are many other Remedies, and those of several sorts, which are supposed to have respect to some peculiar part of the Body, or some particular Disease, and to be appropriated to those ends by a certain kind of specific virtue or operation. Now as concerning both the *ἔτι* and *διότι* of these, at least the chief of them, viz. whether it be really so, and for what reason it comes to pass to be so, it seems now worthy to be inquired into : And first of all we will treat of the Medicines of the Thorax, viz. those that are wont to be prescribed against the Cough, Phthisic, Catarrh, Asthma, Dyspnoea, and other Diseases of the Breast.

*The Authors
purpose in the
present work.*

But since the reasons as well of these Diseases as of medicinal Operations in healing them seem very abstruse and most difficult to declare : therefore before I enter upon this task, something ought to be premised about the parts themselves, as well touching their uses and ordinary actions, as their sicknesses or preternatural affects. As to the first, the parts of the Thorax are either principal, as the Heart and Lungs, with the Vessels appendent unto them ; or subservient, as the membranes and Muscles, with the Diaphragma ; as likewise the Ribs, with the Vertebra's ; then Pneumonic Vessels, with the nervous Fibres and Glandules. The consideration of the Heart and its Vessels doth not properly belong to this place, because not so much the sicknesses of the Breast alone as the general sicknesses of the whole body are usually reckoned amongst its passions. Whereas therefore the remedies appointed to cure the diseases of that region, have special respect to the Lungs, and to the other

*The parts of the
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Organs of breathing serving them; therefore first we will describe the fabrick and use of these parts, then their diseases afterwards, together with the method of cure and remedies; and lastly endeavour to add the reasons of all these.

The substance of the Lungs was always accounted by the Ancients, and mostly hitherto by modern Authors for flesh and a Parenchyma, like the frame of the other bowels; which notwithstanding was accounted lighter and spongy (for as much as it was apt to be distended much by air pufft in, and to float upon waters.) Moreover, whereas the Lungs taken out of an Embryo look red, and sink in water; and the Lungs of some grown persons being boiled, appear compact enough and more solid; almost no man doubted but they consisted really of flesh; until lately the renowned *Malpighius*, a most diligent Searcher of Nature, found those parts to be altogether excaraneous, and meerly membranous; "and therefore he judges the bulk of the Lungs, if the Nerves and certain Vessels be separated with the branches of the *Trachea*, to be a certain heap of little Bladders, and those small Bladders every where stretched out and sinuous, to obtain such position and knitting together, that an entrance lies open into them from the *Aspera Arteria*, and so from one into another, until at length they all end in the Membrane inclosing the Lungs. And truly that it is so, he makes clear to sense by an Experiment. For let a Lung be taken out hot, and let water be so often cast by a Syringe into the Pneumatic Artery, as till the whole frame appear somewhat white, and almost transparent, the blood being clean washed out; afterward this water being squeezed out by pressing, and the air let in by the Wind-pipe, and pen'd in, let the Lung so filled be dried: and it does not only, whilst exposed to the light, outwardly shew transparent little Bladders; but being inwardly cut, it presents a white heap of little Bladders to the eyes. Besides, having viewed it with a Microscope, he discovered a certain wonderful Net, binding and knitting together every one of those little Bladders; which Net consists of the minute productions and branchings of the Artery and Vein; which Vessels circulate the blood by the small and crooked passages, and by the many turnings of the Pipes.

The most renowned man hath found out beside these little Bladders for the most part constituting the frame of the Lungs, a new and more admirable furniture of this Bowel, viz. he shews plainly the bulk of the Lungs to be blown up by almost infinite Lobes girt about with their proper Membrane, which being endued with common Vessels, grow to the small twigs of the *Aspera Arteria*: the insertion and situation of which kind of little Lobes are manifold, as being sometimes affixt to the Basis of the *Trachea*, sometimes to the Ribs, or to its Cone; also according as they end in the outward and plain superficies, or in the corners of the Lungs; and according as they ought to have a due position, knitting and inter-spaces among themselves, rightly to fill up the frame of the Lungs. The little Lobes out of which each Lobe of the Lungs is made up, in the third Table are accurately and to the life expressed.

Certain inter-spaces distinguish these little Lobes (which manifestly appear in a larger Lung or in any other half boiled) which (as the renowned Person hath observed) are not bare cavities or empty spaces, but they have many Membranes spreading from the little Lobes, some parallel, some angular, and are also covered with many Vessels, so as these inter-spaces are certain membranous little bladders, yet transparent and most thin. If you lightly open in one single Lobe of the Lung one of these inter-spaces with the point of a knife, and shall blow into it by a small hole through a Pipe, presently that whole Lobe will be very much extended, every inter-space being pufft up; and then if you bring this frame to the light, the inter-spaces being made transparent, do sever by great intervals every Lobe very conspicuous; and so every rank of the Lobes will appear like a Poly pody-leaf, and under the same figures, as *Malpighius* hath described, and are represented in Fig. 2. of our third Table. But when the little Lobes are filled and extended by liquor easily congealing cast into the passages of the *Trachea*, the appearance thereof is somewhat diverse, and seems in the form of Grapes, as is expressed in Fig. 1. of the same Table. The Veins and Arteries every where accompany this production of the *Aspera Arteria*, and extend themselves through the whole substance of the Lungs by a certain knitting and alike branching. This is plainly perceived by a pleasant sight, in a Lobe of the Lungs being emptied and turgid, Quick-silver being cast into some of the Vessels, and others filled with a coloured liquor. But in dissecting the living, another sort of Vessels, viz. Lymphæducts are manifest to the eye to be spread through the whole Lungs: and we have in another place clearly enough shewn, both very many Nerves and nervous slips every where to be distributed through them. Besides these parts, and the primary

The substance of the Lungs altogether membranous.

Consisting of almost infinite Lobes.

Their little branchings.

The Lymphæducts and nervous slips.

primary or chief vessels of a Lung, some others, and those as it were secondary, are to be observed. For the Pneumonic Veins and Arteries are endued with other sanguiferous Vessels springing from the *Aorta*, moreover with Glandules, and likewise with Fibres as well nervous as moving; and the Wind-pipe is endowed with every one of these, and cartilaginous ones besides.

Whence we may infer, that the entire frame of a Lung is meerly fistulous, and compacted of Pipes of several kinds and magnitude, and variously and most intricately disposed: which although they may appear wonderfully complicated, and many ways twisted and wreathed, are yet every where continuous, and being stretched out with a mutual respect to one another, do hither and thither in good order and regularly convey and dispose the air, the blood, the *Lympha*, and animal Spirits for some accessary uses. To describe as it were with a Pencil this bulk of a Lung, together with the branchings, separatings, and mutual complications of all its Vessels, would be no less difficult a task than to trace the several threads of a harl of silk, and their respect one to another. Nevertheless, that both the Pathology of the *Thorax*, and the cure, may be duly known according to our design, it seems to be material to recite here all the Vessels of the Lungs one after another, and to deliver as well their descriptions, as their preternatural uses and diseases, to which at length the Therapeutic Method shall be subjoyned. And these are the Vessels of which the entire fabrick of the Lungs consists, the Wind-pipe, with the *Bronchia* and little Bladders, Arteries, Veins, Lymphæducts, and Nerves, to which may the parts and appendices of those Vessels be added, *viz.* the Coats of the greater Vessels, which are endued with other sanguiferous Vessels and Glandules, and also with nervous Muscles and Fibres:

Therefore as to the chief Vessels of the Lungs, although all these, by reason of their mutual offices, communicate among themselves with a wonderful affinity; yet the Arteries and Pneumonick Veins attend on the *Trachea* and its partitions the most exactly; for the branches and sprigs of every one of these springing alike from their respective stocks, and stretcht out to and fro, go on every where with like pace; so that the *Trachea* and its branches are always in the middle, above that the Vein, and beneath the Pneumonick Artery are carried, and all are distributed with an equal and sociable branching: and the sprigs and branches, sent from each of them, are presently applied to their like, and are interwoven like wonderful Nets, of which the texture of the Lungs is almost totally constituted. It will be impossible to describe the spreadings out and various complications among themselves of all these going on together, as to the lesser sprigs and slips; yet if you will cast into every vessel apart Quick-silver, hot and flowing Gypsum, Wax mingled and made liquid with Oyl of Turpentine, or some such matter, which will extend all over the chief passages, and continue them stufft, then you may exactly enough represent the figure: and after that manner the frame or texture of the whole Lung may be conceived, each being described by it self and apart. Wherefore upon these and all other Vessels and parts of the Lungs we will treat in order; and first of the *Trachea* or Wind-pipe.

The Wind-pipe or *Aspera Arteria* is a Pipe somewhat long, consisting of Grisses and Membranes, which beginning from the Throat or lowest part of the Jaws, and leaning on the Gullet, and descending into the Lungs, is dispersed by manifold little branchings through their whole frame. It is divided into two parts by the Ancients, *viz.* the upper, which is called the *Larynx*, and the nether commonly called *Bronchus*; to which a third or lowest is added, by *Malpighius* called *Vesicularis*, or the bladdery one.

The former of these, which is the beginning of the *Aspera Arteria*, doth chiefly serve for vociferation or loud noise, formed of many and various Grisses, to which also are joyned proper Muscles; the description and use of all which are so exactly delivered by Anatomists, that there is no need of dwelling longer on the description: we only advertise for methods sake and by way of abridgment, that the *Larynx* contains some greater Cartilages of divers forms, and some uniform; the former, by reason of resemblance, bear the denomination of *Epiglottis*, the Buckler-like Cartilage the Ring-Grisse, and *apopharyngeus*. To this last doth succeed a continual rank or row of Cartilages, fashioned altogether after the same figure and manner; every one of which, whereas they resemble a circle, but not compleat, are disposed after such a sort, as if one so compose many wooden Rings, that there should grow up from the sides of them, by laying a good many one upon another, a certain Pipe as it were with Ribs. These circular Cartilages are equally distant one from another in their whole passage, and are knit together by the benefit of an inner Membrane (which fills up the spaces between like the *Periostium*) as with a ligament. But the hinder part of every Ring-like Grisse where it lies upon the Gullet, that it may serve

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The Vessels of
a Lung.

Wait on the
Trachea.

The description
of the Trachea.

The description
of the Larynx.

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better to the swallowing of meats, turns into a Membrane, which altogether is the same, and binding together those cartilaginous rings, and covering the whole hollowness of the *Larynx*, is always moist with an unctuous humour, by which it may as well be defended against the sucking in of sharper air, as breathing out more acrimonious vapours.

Membranes encompassing the wind-pipe.

Besides this inner Membrane, also another outward, though thinner, encompasses the whole Wind-pipe, by the aid whereof both the Cartilages are more firmly knit among themselves, and the whole Pipe bound to its neighbouring parts, and descends more safely and strongly into the Breast. Besides, we judge there are some other uses and offices of either Membrane, than that it only serve to fashion or defend the sides of the Wind-pipe: for as much as we do here manifestly observe many Nerves and nervous strings every where inserted, and also the more inward Coat of the *Aspera Arteria* to be endued with Fibres, as well nervous as fleshy or musculous: from whence we may conclude the Wind-pipe to enjoy both a certain sense and motion either in the whole, or at least in some parts. And truly it is manifest even to common observation, that its more inward passage doth excel with a most acute sense; for as much as it is so much provoked by the smallest prejudice, that presently it is wonderfully forced into a convulsive motion, viz. a Cough: but as a sense of annoyance, and from thence very often an instinct of motion arises from this Vessel; so we think that its Fibres do after a sort move of themselves both in breathing and coughing. Surely in respect of this it is not to be doubted, because in this inner Membrane we find two orders of muscular Fibres in that fashion disposed as in the *Aorta* and Intestines: to wit, there is one upper order of straight Fibres, which while they are contracted, make all the circular Cartilages to be drawn together nearer to one another, and for that cause to abbreviate the Trunk of this Vessel according to all its parts successively. Under this lies another order of circular Fibres, which (while they are puffed up) being contracted, the hollowness of the Wind-pipe is much narrowed. Therefore when the moving Fibres of either kind make the passage to be straitned according to all its dimensions, it is obvious enough that they conduce to the discharge of the function of breathing, and more or less to be active, as there is endeavour to breathe quicker or slower, more intently or more remiss. These Fibres being more vehemently contracted in a Cough, in hawking, in blowing out, and certain other more strong exercises of expiration, do force the breath and other contents of the *Aspera Arteria* to be violently expelled. Moreover from this action sometimes either depraved or hindered, it shall be declared hereafter how an Asthma, a Dyspnoea, and some other diseases about breathing do arise.

The glandulous and vasculous Coats.

This inner musculous Coat hath also two others, as if growing thereunto, to wit, one glandulous, and that full of vessels. For as in another place we have remarked about the Anatomy of the sanguiferous Artery, one may also here take notice, that the inward Pipe of the Weazand is covered with a most thick weaving of Vessels of every kind, and especially of those carrying blood, in fashion of a Net. The Arteries not springing from the Pneumonic Vessels, but from the Bronchial branch (which the most renowned Mr. *Ruisch* discovered to have its rise from the *Aorta*) are inserted into this same; which the veiny slips do accompany, owing their origine to the *Vena cava*. The nervous sprigs meeting these two, are variously folded; and so of all weaved together, is framed as it were a little Net, covering the whole back of the Weazand, under which folding of Vessels very small and whitish Glandules are every where srewed, or rather cleave to them; just in the like manner, as we have in another place shewn to be in most other greater Vessels, and in all membranous Bowels: on all which the Lymphæducts adjoynd do wait. As to the use of these, without doubt the Arteries and Veins wash through the Pipe of the Weazand with bloody stream for its nourishment; and the Nerves carry plenty of Spirits, and the faculty of performing motions to the muscular Fibres. Afterwards whatsoever of superfluous moisture be left by the Arteries, that the Veins cannot bring back, the Glandules do receive and retain, until it may be sent back to the mass of blood through the Lymphæducts. When they are too much filled, by reason of the Lympha more plentifully left, a humour distilling from the Glandules as well as from the Arteries into the hollowness of the Wind-pipe brings a Catarrh. All the Coats of the *Aspera Arteria* distinct and separated from each other are expressed in the seventh Table.

Of the Bronchia.

The second part of the Wind-pipe, commonly called *Bronchos*, begins from the entrance of the Lungs: for near the fourth Vertebra of the Chest that great Pipe descending, is divided into Two Trunks, one whereof goes towards the right side of the Lungs, the other the left: afterwards both having entred the Lungs, and being subdivided for the greater Lobes, distribute very many sprigs (as for the most part in the

the gills of fishes) to the Lobes or lesser Lobes through the whole frame of the Lungs. The passages of all these are furnished, even as in the Larynx, with Cartilages, but framed something in a differing manner: for in the *Bronchia* these are not Ring-like, but resembling a Coat of Mail, so that when there is need to contract those passages, the inferiour Cartilage goes under the hollowness of the upper, almost in the same manner as it is in the joints of the shelly Coat of a Lobster. Provision is so made by the work of God, that when the Lungs are dilated, the *Bronchia* are stretcht out into the greatest length; and when they are contracted, the *Bronchia* are abbreviated, one part being drawn into another.

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The Coats of the *Bronchia*, as also of the Larynx, have muscular Fibres of both kinds, together with the Glandules and the Net-like twisting of Vessels: from whence we may also conclude, that all the lesser Pipes of the *Aspera Arteria* have their constant turns of Systole and Diastole, viz. all the Pipes are contracted while we breath out; and relaxed while we suck in air: moreover from the same Glandules and little Net of Vessels every where continued almost within every inward recess of the Lungs, doth distil the Catarrh humour. A certain Bronchial branch of the *Trachea* belonging to each Lobe of the Lungs is described in the second Table H. H.

Their Systole and Diastole.

And the branched *Bronchia* of both sides not only constitute two or more greater Lobes; but as *Malpighius* hath observed, many lesser or little Lobes distinct among themselves; for each Bronchial branch sends forth to and fro many little branches or twigs, every of which twigs being joined with alike twigs of the Pneumonic Artery and Vein, from thence are parted into innumerable lesser sprigs; all which being every where fellowed and complicated among themselves, and having got Nerves and peculiar Lymphæducts, and ending in the outward superficies of the Lungs represent as it were a certain private Grove; and so the whole structure of the Lungs consists of many little branches of the aforesaid Vessels complicated, as it were of so many several Groves. The branches whereof and outmost sides of which, although they may seem mutually to touch themselves and cleave together, yet they are disjoyned one from the other, and are every one bounded within their proper limits; far otherwise than the productions and communications of Vessels are in the Brain, where the Arteries and Veins rising up in its several Corners, extend on every side, and creeping through its whole space, and mutually inosculating, do all communicate among themselves.

The Lobes of the *Bronchia*.

Their little branchings disjoyned from one the other.

That former fashioning of the Vessels hath been very necessary to the uses of the Lungs; for seeing the air ought only to enter the Lungs for that end, that it might pour out to the blood nitrous particles for its flame and vitality or life, and presently return back; and seeing the blood doth pass through the Lungs for that cause, that it might meet the air suckt in according to all its parts; therefore it behoves that both these, viz. the air and the blood be divided into small portions, and with these make every where distinct and short meetings. The manner of this is most elegantly perceived in the gills of fishes; for seeing the *Bronchia* are as so many greater Lobes, every one of these is divided into many rundles, furnished with a complication of every kind of Vessels, as if it were into so many Lobes; in every one of which the blood is drawn out by minute portions, as it were little rivulets, that it might thoroughly meet with the nitrous particles, and afterwards return into its channel.

The use of the aforesaid frame.

The bronchial Pipes lead into the utter cavities, viz. into the numerous little Bladders discovered by *Malpighius*; which truly are certain continued parts of the *Aspera Arteria*, but distinct from the former, because the Grilles are wholly wanting to them, and, which supply the turn of these, are distant one from another in larger spaces: for all the Bronchial branches send forth lesser slips from themselves every way; whose passages, although void of Grilles, notwithstanding are straitned as it were with certain ligaments at certain intervals; and the spaces between these being filled with air suckt in do make partly those small bladdery little Cells. In truth those passages may not unaptly be compared to the Gut Colon of a Mouse, whose continued hollowness in as much as it is girt about in divers places, seems to be divided as it were into many little purses. Moreover those bladdery passages being shorter on either side the Sinus or hollowness, have as it were particular little Bladders growing thick to them, and therefore the heap of all the Cells seems not much unlike to a bunch of Grapes. The Figures of these as much as may be are exactly represented in the third Table. Those little bladdery Cells, that they may put forth their contracting endeavours for breathing, have muscular Fibres, as is plainly seen by the Microscope. For as much as great plenty of air ought to be drawn within the Lungs, and reserved in part lest it fail at any time; therefore besides those up-
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The uses of the little bladdery Cells.

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per passages which are as it were the threshold and dens, moreover more inner chambers and capacious are required, in which the air may be treasured up, and from thence be dispenced upon occasion. For it sometimes happens the external is too sharp, or otherwise disagreeable to the Lungs; so that as it was greatly necessary that it should be suckt in more sparingly, and its vehemence presently be attempered and rebaited by the air treasured within. Moreover it cannot be drawn in or inspired otherwhile in quantity great enough, as in running, singing, or much speaking, also in some crazy dispositions; and in that case the inward air being rarified, supplies in a manner the defect of the outward.

Endued only
with muscular
Fibres.

Therefore seeing those bladdery little Cells receive a greater stock of air than that they can be bound presently to return it all by every turn of expiration; therefore the grilly twigs are wanting to them, and their hollownesses are more large of themselves, that they may be more largely distended: but that they may puff out a greater quantity of air upon occasion, or throw out matter to be coughed out, being endued with Muscular Fibres, they contract themselves more narrowly, and throw out what is contained within them thoroughly. For the ordinary Systole's of the Breast, which the relaxation of the Muscles do partly effect cast out perhaps at every turn the whole air from the *Trachea* and *Bronchus*, but not from the little Bladders: for the emptying of these as often as need shall be, both the cavity of the whole Breast is very much straitned, and the small bladdery Cells themselves are straitned from their proper Fibres being drawn together.

The description
and use of the
Pneumonic Ar-
tery.

2. The Next Vessel is the Pneumonic Artery, of whose most thick branches extended every where to and fro, and with other branches twisted and complicated together, the frame of the Lungs consists. This Artery issuing from the right *Sinus* of the Heart, and inclining towards the *Trachea*, is parted into a right and left branch; which applying themselves to the like parallel branches of the *Trachea*, do accompany them every where, or rather are set under them; for they are planted beneath, and are first carried into the greater Lobes of the Lungs, and afterwards into all the lesser Lobes: in every of which the little branch of the Artery stretched out, sends out on either side more slips from it self, which presently are associated by other bronchial and venal slips, and are several ways complicated; and where the outmost sprigs of the *Aspera Arteria* depart into circular little Cells, the Arteries being complicated with the Veins (as is discovered by the Microscope) do girt about those little Bladders with their thick branching, and enwrap them like Ivy; from whence we may conjecture, that it is not for nothing that the Blood-vessels that are any where in the Lungs, do curiously wait upon those of the air, and every where insinuate and intimately mingle themselves. Surely whatsoever hath been supposed by others, I shall not easily believe that this is done for the more exact mingling of the Blood and its parts, be they never so unlike. For to do that, what need would there be of so full an access of air, which in rightly making other mixtures (the more perfect whereof are called Digestions) we seek as much as we can to keep out? For if the air might freely come and go, the Particles that should be mixed, would most of them fly away. And as to that which is affirmed, That the Blood in the Lungs is carried through those small, winding and extream narrow passages only that it may be the better mixed; I say, that its being so carried is quite contrary to such an intention: For the best mixture of any liquor (as also of the Blood it self) is made by fermentation; and the liquour to be so mixed or fermented, like Wine in a Hogshead, requires a free and spacious room: but its going through these small and narrow passages like so many strainers, serves rather for the separation than the mixture of its parts; wherefore unless the Blood be exactly mixed in the greater Vessels, and be there rightly fermented, it does, while it passes through the Lungs, leave there the dregs and whatsoever parts are not rightly mixt, and so does stuff up and very much obstruct their passages; as we may see in persons affected with the Green-sickness, Cachexy, and that sort of Dropsie called *Leucophlegmatia*, who all have a difficulty of breathing, by reason of dregs of the ill-mixt Blood that are left there. Wherefore the use of the Lungs seems to be this, That the Blood through the lesser Vessels, as so many rivulets, may as to all its parts lie open to and meet with the nitrous Particles of the Air, and be by them enlivened and accended. The Pneumonic Artery, as also the *Aorta* and Wind-pipe, hath a muscular Coat furnished with two ranks of Fibres, namely straight and circular; which doubtless, when they are contracted, do make the Pneumonic Arteries to beat, and the Blood to be urged and driven still more and more forward. A great many Glandules with a Net of Vessels lie on this musculous Coat. The frame and branching of the Pneumonic Artery in some one Lobe of the Lungs are expressed in the second Table. All the Coats of this Vessel are drawn

drawn distinct and apart from one another in the sixth Table and first Figure, and also in the fourth Table and second Figure.

The Pneumonic Vein, having its rise in the left Ventricle of the Heart, and being divided and variously subdivided first into greater branches, and then, according to the greater and lesser Lobes of the Lungs, into lesser, and lastly into the least of all, is carried above the Weazand, and as it goes on does exactly answer to the branching both of the Pneumonic Artery and the Weazand, and goes every where with them as it were cheek by joll; and where the Weazand ends into the little Bladders, the Veins being twisted with the Arteries (as was said before) do make as it were a little Net wherein those little Bladders are encompassed: The Anatome of the Pneumonic Vein differs little or nothing from that of the *Vena cava* and its branches. All the Vessels of this kind have four Coats distinct from one another.

1. The outmost of these Coats consists of Fibres that seem to be nervous, which perhaps are after a sort muscular and are extended straight long-wise, (though in no very regular order.) This Coat of the pulmonary Vein is very laxe, and loose from the rest of the Vessel, insomuch that it may all of it be blown up and very much extended, as if it were a distinct Vessel: Whence one might suspect that this were a peculiar passage to carry back *Lympha* or *Serum* separated from the Blood: but it seems to be more probable, that this outmost Coat is therefore made so loose, that the passages might be much distended and widened for the return of the Blood now hot and boiling.

2. 3. Two other Coats (common both to a Vein and Artery) *viz.* the vasculous and the glandulous lie under this: the office of the vasculous is to bring nourishment to the part, and of the glandulous to receive and send away the superfluous serofities.

4. The fourth and inmost Coat is plainly muscular, having Ring-fibres, as the like Coat of an Artery hath, which certainly being successively contracted after the stream of Blood, do cause its return to be hastened, and on occasion to be shortened. But here arises a doubt, wherefore, seeing the Veins as well as Arteries have contracting muscular Fibres (which in the latter are pulsifick) and seeing both are alike joined to the Heart that beats continually, the Veins as well as the Arteries should not stately beat according to the constant turns of the Systole's and Diastole's in the Heart? It may easily be answered to this, *first*, that the Arteries have a great deal more of the moving Fibres than the Veins have; and therefore whereas *those* being strongly contracted successively, do force the Blood along as if driven with a wedge, for *these* it sufficeth that whilst they are gently contracted behind the stream of Blood, they calmly and equally drive it forward, flowing back again of its own accord, and as it were down-hill. But *Besides*, the reason hereof seems to depend somewhat on the unlike or rather inverted conformation of the Vessels; for the Blood conveyed by the Arteries is driven still from wider to narrower spaces, and therefore going along it every where violently distends them, and lifting up the sides of the Vessels raises the Pulse; because whilst that part of the Artery that is behind the Blood is contracted by its muscular Fibres, that part which is before it, must needs beat being filled with the stream of blood gushing in: but on the contrary, the blood in the Veins returning to the Heart, runs out of less into greater spaces, or out of rivulets into a more capacious and deep chanel, and therefore glides along silently and without the fluctuating of a Pulse.

The blood in the pulmonary Veins seems as much, or more than that within the Arteries to be animated or inflamed anew by the air insinuating it self every where from the Pipes or little Bladders of the *Trachea*, because in those Veins 'tis first changed from a black-purple to a scarlet: the reason whereof is, because the blood at the extremities of the Vessels, namely as it passes out of the Arteries into the Veins, does every where and most of all meet with the particles of the air. And for that reason it is, that if any liquor be squirted into the Pneumonick Artery, it will not so readily and quickly pass through the Lungs and return by the Vein, as it will do if you make the same experiment in any member, or part of the body besides; yea part of the liquor so injected will sweat through into the Pipes of the *Trachea*, or the spaces between the little Lobes, and another part, being turned into a froth, will return very slowly by the Veins: which is a certain proof, that while it passes through the Lungs it makes a stay in the mouths of the Vessels, and is mingled with the airy particles. The Circulation of the blood through the Lungs hath something diverse from, or rather contrary to that which is made through the rest of the body; seeing the Pneumonic Arteries contain a black-purple blood, and the Veins a scarlet, whereas in all the body besides the branches of the *Aorta* carry a scarlet blood, and those

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The description
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Pneumonic
Vein.

The use of the
venous and vas-
culous Coat.

The Muscular
Coat.

Why there is no
Pulse in the
Veins.

The disposition
of the blood in
the Pneumonic
Veins.

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Part. II.

those of the *Vena Cava* a black-purple. Besides we may observe of the pulmonary Vein, that it does every where in its whole length want valves, except where 'tis fastned to the Heart. Which appears by this, that when any liquor is injected into its trunk (just as it is in the Artery) it presently passes through all its branches without lett. Which ought to be so, to this end, that the blood may always, because of the violence of the passions, freely every way fluctuate and regurgitate in and about the Heart. Besides, that the left Ventricle of the Heart might never be overcharged with the blood impetuously rushing into it, by the instinct of Nature the Fibres at the root of the Vein being contracted, its course might be inverted and flow back. The description of the Pneumonic Vein as to its utmost branching is in the fourth Table and third Figure.

The Lymph-
ducts added to
fore said

To these three sorts of Vessels, wherein the air and the blood are conveyed, the Lymphæducts that carry forth a water are joyned. A power of these dispersed through the Lungs, wait on the Arteries and Veins. All the branches tending from the surface of the Lung towards its original, unite into some greater trunks; which, being inserted into the Wind-pipe, discharge therein the Lympha that is superfluous from the blood and nervous humour. Indeed there is need of a great many of this sort of Vessels in the Lungs; because, seeing the blood is hottest of all here, is hastily circulated, and yet can exhale nothing to without by transpiration, the Veins can hardly receive all the whole mass of blood from the Arteries; and the Glandules contain not long what is deposited in them: therefore there is need of Lymphæducts as so many channels, whereby the superfluous humour might continually be sent off. If these at any time happen to be obstructed or broken, there often follows a Dropsie of the Lungs or Breast, and sometimes Coughs and Phthisicks. These lymphatick Vessels of the Lungs may very well be seen, if in dissecting a live Dog you press the top of the Thoracick duct, that nothing may be poured into the subclavian Vein: for then the Lymphæducts of the Lungs, because they cannot discharge themselves into the common Receptacle now stoppt and filled, swell much and are very apparent. If such a stoppage be made for some time in a Dog that hath eat and drunk largely, a milky liquor will sweat into the Lungs out of the Thoracick duct, the Valves being unlocked: yea and the same liquor will pass through the Lymphæducts placed far beneath the Reins, and will render them stratted with that humour, as if abounding with milk. The rough delineation of the Lymphæducts spreading themselves in the superficies of the Lobe of a Lung, is represented in the first Table.

The nervous
sprs dispersed
throughout the
Lungs.

5. The last kind of Vessels belonging to the Lungs are the Nerves and their branches, whereof there are many (as we elsewhere intimated) dispersed every where through the Lungs. Heretofore doubting about the office of these, we were induced to think the first force, or at least instinct of breathing depended on these Nerves; because otherwise we can hardly conceive, after what manner the motion of the Lungs in breathing, coughing, laughing, and other their actions should be always so exactly proportioned according to the several exigences of Nature. For even as the blood doth more intently or remissly heat and boil up within the *Præcordia*, and as certain contents of the *Trachea* provoke the nervous Fibres, we breath either quicker or slower, and oft-times, though unwillingly, we cough. But besides there doth occur another and more necessary use of these Nerves: for since it is manifest, that the Coats of those Veins and of the *Trachea* are every where endued with muscular or moving Fibres by which they are contracted, it is plain, that the Pneumonic Nerves do convey as well plenty of spirits, as inclinations of contraction to those Fibres. And it is very probable from those Nerves convulsively distempered, that the Palpitation of the Heart is often excited, as also the Asthma and Chin-cough. We have some time since delivered the Anatomy or description of the Pneumonic Nerves in our Treatise of Nerves, viz. pag. 311. so that there is here no need to repeat or enlarge. The five-fold Vessels forementioned being mutual, and many ways accompanied in their distribution, as if divided into secret Groves with small bladders as in Trenches every where interwoven, when they are complicated and variously woven together do constitute a fleshy web, which is the very structure of the Lungs: which moreover appears like a more solid *Parenchyma*, in as much the Arteries and Veins being filled with blood are stufft up, and the Vessels of the *Trachea* and Lymphæducts being emptied of the air as well as water, do fall together and seem to close. We shall the less admire the fleshy fabrick of this Lung wove together out of meer Vessels and little Bladders, if we consider the frame of the seminal Testicles to be nothing else than a heap composed of hollow filaments or spermatic Pipes woven together. The description of the Nerves of the Lung, and what relates to the bundle of Fibres whereof it is compact, and to the spreading of its branches, are described in the fifth Table.

The

The web of the Lung, as above-said, being weaved together of Vessels and little Bladders, and divided according to their greater and lesser branchings into Lobes and little Lobes, a Membrane wraps them about as a common covering. Of this there are two Coats, viz. one outer and fine, which appears like a certain subtle texture or weaving together of nervous filaments (as is apparent in most other Bowels;) the other more inward, which is both rough and somewhat thick, and consisting almost of meer ends of Vessels and little Bladders: and by reason of the hollowneses every where caused from these, its inward superficies resembles a Hive of Bees; the forms of these are aptly enough described in the eighth Table. This Membrane of two Coats blown up hath very many and large Pores, insomuch that if Quick-silver be poured into the Tracheal branch of one of the lesser Lobes, almost filling within the whole Membrane, it will every where burst out from the Pores. Both the arterial blood and the air beating in this Membrane as against a bank, are reflected; the former is brought back by the Veins into the left Venter of the Heart, a certain watry part being sent away through the Lymphæducts. In the mean while the air is returned back by the same passages of the *Trachea* by which it flowed in. For continually fresh air ought to be sucked in, that it might supply nitrous Particles to the Blood; to make room for which the other old air being now weak and useles, must be first breathed out. Because therefore both functions are to be performed within the same passages, it is to be done by alternate turns, first the one, then the other. While the air is drawn in, the Lungs are blown up, as if wind were forced into them; and whilst the same is breathed out they fall down, and are narrowly squeezed together for the benefit of excluding it; and so after the manner of Bellows discharge constant changes of the Systole and Diastole. Yet by what impulse and Organs it is accomplished, is worth our labour here to consider.

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The Coats of the Lungs, where-
of one is smooth,
and the other
rough.

Therefore upon the whole matter it is manifest by common observation, the Diastole of the Lungs perpetually succeeds the opening the Breast, and its Systole in like manner its contraction; so that we may conclude, when the cavity of the *Thorax* being dilated a greater space is yielded to the expansion of the Lungs, the external air of its own accord leaps into the *Trachea*, whether by reason of the Pulse, or by its own Elastic force (for it is all one) and presently enters into its Trunk, the *bronchia* and all the little bladders, and blows them up; namely for that end, that its nitrous particles may every where occur to the blood, washing all parts of the Lungs: afterwards when the breast receding from that dilatation, is straitened as to its cavity, even the Lung being compress'd, falls together by its Diastole, and excludes the air even now breath'd in. But truly, because the air doth not of its own accord leap out with that plenty as it skipt in, neither the hollownes of the breast so straightly contracted, that it should mightily compress the Lungs; therefore all the passages of the *Trachea* are endowed with muscular Fibres, which being contracted orderly while we breath out, they may promote the expulsion of air. Wherefore, that the cause of breathing, and the manner of doing it may more plainly be made known, inquisition ought to be made after what manner, and by what Organs, that interchangeable dilatation and contraction of the breast are performed.

The Systole and
Diastole of a
Lung.

We cannot enough admire, concerning these motions, the cunning artifice of the Divine Creator, evidently adapted unto Mathematical rules; for truly in no other matter doth He more plainly appear *ὁ θεὸς γεωμετρεῖν*. For when both the enlarging and the straitening of the breast ought to be performed by some muscles (to whose function it only belongs to contract;) the matter is so ordain'd, that the ribs which shape out the sides of the *Thorax* even as of oblong parallel lines bowed towards a Cylinder, are brought one while in a square figure with right angles for the enlargement of the breast, and afterwards into the form of a Diamond-figure with sides unequal, with acute angles for the contraction thereof. What follows from the situation of parts so chang'd, that whenas the sides depart farthest from one another, the ends are brought nearer, and so *ἐκτὸς*; and for that cause the largeness of the space is wont rather to be altered than either augmented or diminished; lest it may so happen about the cavity of the *Thorax*, it is so provided against by an admirable workmanship, that whilst the ribs ascend upward for enlarging the breast to a square figure, lest the ends should be shortned inward, the *Diaphragma*, which closes the bottom, swells downward toward the Abdomen; so that the *Thorax* may be enlarged as well towards its length as to its depth: on the contrary, while the ribs beneath are brought to straiten the breast towards the figure *Rhomboides*, lest they should depart farther than they ought, the *Diaphragma* ascends upwards for that cause that the largeness of the *Thorax* may be straitened, while we breath out, according to both dimensions.

Its motion me-
chanically un-
folded.

PHAR.
Part. II.The Muscles
serving respira-
tion.Their function
as well in in-
spiration ;As in expira-
tion.

What belongs to the muscles of the breast, serving as well to the enlargement for sucking breath, as to the constriction for breathing out, the most wise Creator of Nature hath ordained more and sundry instruments of either function ; Therefore truly that the work of breathing being especially necessary as to life might be performed incessantly and very strongly, some of the former order of Muscles, *viz.* those by which the hollowness of the *Thorax* is opened, do raise the ribs and afterwards draw them back, even as they are bow'd and more enlarg'd ; in which number there are three muscles to the shoulder, one belonging to the loyns, and eleven intercostal outward ; and another inward muscle, *viz.* the Diaphragma, depresses the bottom of the breast, and enlarges its length and depth.

The aforesaid muscles, *viz.* the scapular, lumbar, and intercostals being also appointed with the Diaphragma for the function of breathing, are accurately enough describ'd by many Anatomists, but chiefly by *Fallopins*, that here seems little need to unweave this web ; especially because a more full and permanent knowledge of these parts is not wont to be acquired unless by frequent dissections and anatomical inspection. The four former muscles being of divers forms, conduce chiefly to stronger and violent inspiration ; but the exterior intercostals in regard of the ordinary actions of breathing employ their continual endeavours by turns during life, every one of these being uniform, with a fleshy and more thick basis, being rooted in the bottom of the upper rib are carried by oblique fibres, and broad towards the forepart into the top of the rib that lyes under, and are implanted to it with a small and tendinous end ; whence it follows, those fibres being swell'd ; and shortened towards their root, do lead and draw back the nether rib towards the upper ; and so while all these muscles are contracted together, all the ribs are raised upwards, and altered from oblique angles into direct ones, they render the trunk of the *Thorax* more large, but something shorter ; which defect that it may be helped, the Diaphragma (which being free before from the Systole, is hidden within the cavity of the breast) together with the ribs drawn upwards, is extended beneath ; so that the breast, as it were a Drum braced, does become most capacious ; and in the mean time the Lungs, having a more ample space yielded to them, are blown up by the air rushing in wheresoever there is passage, and fill the whole hollowness of the *Thorax* enlarged.

Thusfar touching the muscles serving to inspiration, which ever and anon ceasing from contraction, the ribs presently fall down from a direct position into an oblique ; and the Diaphragma also being freed from its extension ascends into the cavity of the breast, or is rather thrust thither by the bowels of the Abdomen ; and so by reason of the position of parts so changed, *viz.* the breast straitned, and the Lungs compressed, the act of expiration doth succeed. Some have determin'd this to be a meer intermission of the other, and only to proceed from the rest, or ceasing of the muscular motion (by which breathing is performed.) But the declination of the ribs from right angles into oblique, and the ascension of the Diaphragma, is related to be the natural position of these parts, because they are found in such a situation in dead bodies. I think my assent not easily owing to this opinion, because sometimes the function of expiration is performed much stronger and more violently than that of inspiration, as in coughing, singing, laughing, hollowing, and in other effects whose exercises are the more difficult labour and more earnest endeavours of the breast. Wherefore there is no reason that we should think that such vigorous exercises of expiration, should be excited by the meer rest and ceasing of the aforesaid muscles, but from the motion of others opposed to them. Moreover the Muscles now cited and opposite, and straitning the breast, seem to be required not only by reason of their violent expiration, but for their ordinary and constant service, at least for the poising the function of respiration : for otherwise those other whose office it is to enlarge the cavity of the *Thorax*, being sometimes unmindful of their task, do it either stronger or longer than is convenient ; wherefore it is necessary they be forthwith admonished by others, *viz.* their Antagonists subservient to Expiration, and to be restrained in their duty. But the Muscles appointed for the straitning the breast, are the *Sacrolumbus*, the Triangular, and inward Intercostals, and some muscles of the Abdomen ; the use and descriptions of all which are delivered by many Anatomists and most accurately by *Fallopins*. The inner intercostal muscles as they obtain a contrary situation, so a contrary function to the outer intercostals, which namely is to depress the ribs, and to straiten the cavity of the breast, by forcing it into the *Rhomboidal* Figure. For we are to observe, that the carneous and thicker basis of each of these is implanted in the lowest part of the nether ribs, and the moving fibres, ascending from thence obliquely and forward, and dividing cross-wise the rest of the outward intercostals, with their smaller and Tendony end are engrafted in the bottom of the upper-rib ;

rib, hence none need doubt, but that these inner muscles do depress all the ribs, or bring them downward: but whilst these ribs are so depressed that the trunk of the breast is rendered more strait, these inward muscles (otherwise than the outer) do not only incline the ribs downward, but also their gristly or cartilaginous processes. For *Fallopins* hath accurately described this: *That the outward intercostal muscles do only fill up the inter-spaces of the ribs and not of the gristles, but the inward fill up both spaces.* The reason whereof seems to be after this manner, affording a most delightful speculation of the *Divine Architect*, viz. while the ribs are brought upwards to the exercise of fetching in breath, and are withal drawn back towards the Spine; that motion commencing backward, is performed by the ribs themselves; which being first moved together, the cartilages easily discharge their function as cords fitted to that purpose; wherefore there seems little need of the muscular aid to place these in their order; but to put the ribs in action, not only the intercostal muscles afore mentioned, but the four other greater ones do continually endeavour it; but on the contrary, that the ribs may be depressed and brought forwards together, the force taking its rise before, is performed by the cartilages as so many leading cords, most easily bending the ribs downwards as far as need requires.

Moreover to this end, that the cartilaginous appendices of the ribs may be drawn down and nearer one the other for the exercise of expiration, not onely the inward intercostal muscles fill as well the intervals of the cartilages of the ribs, but moreover an entire triangular muscle is allotted for this function; for this springing beneath from the bone of the Sternon, and ascending upwards obliquely, is inserted into the lower Cartilages, which it constrains towards its head, and bends the *Thorax* nearer on the other side. That is worthy of consideration, which *Fallopins* hath remarked touching this muscle, viz. whereas it is so little and minute in a man, that it may hardly be allowed for a Muscle, it is stretched out in a Dog along the whole bone of the Breast, and reaches to all the Cartilages, even those insculcated into the Sternon of the true Ribs. The reason of which difference clearly points at the Divine Providence touching the Fabrick of Animals. For whereas this Animal is born to most swift and long running, that the blood, while it is more vehemently agitated, may duly be kindled and fan'd, as it ought swiftly and strongly to draw in the air, even so to expire it; (for that fresh air may be more freely suckt in, it behoves that all the old be strongly cast out and exploded) therefore for the stronger discharge of this exercise (of the which little use in a man) this Muscle of a Dog is allotted a great bulk, proportionable to such a work.

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Wherefore the triangular Muscle being small in a man, is stretched out through the whole bone of the breast in a Dog.

Hitherto of the Muscles that straiten the Trunk of the Breast by whose provision it is manifest enough, that the relaxation of the opposite muscles are not sufficient to this function. But that while the breast is constrained, the Diaphragma ascending upwards may shorten its hollowness, it is not enough that it is released from its contraction, but it is also necessary, that as soon as this ceases, the muscles of the Abdomen being contracted squeeze together the Bowels, and press them upwards, by which the Diaphragma being relaxed, is lifted up and driven higher into the Trunk of the *Thorax*.

The Diaphragma follows the motion of the Abdomen.

From the supposed reasons of these things we may infer, no less endeavours of the muscles are employed in the exercise of expiration, than in inspiration: nay rather we may affirm them greater, after this is added, that the Pipes of the *Trachea* and *Bronchii* are endowed with muscular Fibres (as we have shewed) which being only contracted while we expire, do cause the air contained within to be cast out with the greater force. And truly so it ought to come to pass, because the air prevailing with an elastic force, doth of its own accord readily enter the plumonary passages, as often as they are suffered to be open; but from thence that again it may presently and thorowly be excluded, there needs a certain force and compression of the parts to thrust out. For although the inspiration precede in course, yet it is necessary that expiration follow immediately after, and be proportioned according to the fashion thereof; for that it may be great, the turns or changes of this being greater are requisite. Wherefore in vehement exercise of the whole body of the Lungs alone that the fresh air may more plentifully be drawn in, all the old air must be moved, not only out of the *Trachea* and *Bronchii*, but also out of the farthest little Bladders every turn or change of breathing out; and expelled most of it: whereas while we draw in the breath only the muscles of the Breast are employed, the Lungs having respite, in strong breathing out both the opposite Muscles and the Lungs themselves labour.

The labour of Muscles, the same in expiration as in inspiration.

Having thus explained the Organs of Breathing, it remains yet to be inquired into, by what instinct, being stirred up to motion, they so repeat perpetual changes of Systole and Diastole, that one while these muscles are contracted for inspiration, and

The causes of the above-mentioned motions.

another

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another while for expiration, in the mean while the opposite muscles have a pause, and are moved by turns, that they mutually give place to themselves successively. From all this in the first place it is clear (which likewise in another place we have abundantly declared) that the animal Spirits, for the exercising the contractive motion of the muscles, leap from the Tendons into the fleshy Fibres, and afterwards for their relaxation they recede out of these into those. Moreover, whereas the mutual function is twofold, viz. spontaneous and merely natural, we have before shewed in the former, that the Spirits are brought from the Tendons into the fleshy Fibres by approaches according to the command of appetite, and to remain within during the action, till they are dismissed by its will; and afterwards return into the Tendons, till they are again commanded forth; insomuch that the times of their motion and rest are unequal and uncertain, and variously determined at our pleasure.

In the animal
function.

And natural.

But it is far otherwise in the natural function: because the animal Spirits are carried out from the Tendons into the flesh by perpetual turns, or constant reciprocation, and a short contraction being made, presently leap back from the flesh into the Tendons, and so alternately: after which manner the Heart it self, the Organs of the Trachea and breathing, also the fleshy Fibres of the Stomach and Guts, unless they are otherwise limited by reason of their objects, are drove on by their constant Systole and Diastole.

The motion of
the former sort
ariseth from the
brain, the other
from the Cere-
bellum.

It will be needless to repeat here what we have already observed in another place touching these two kinds of motions, viz. that the animal spirits of the spontaneous moving function are altogether or chiefly dispensed from the brain, and the others causes of the merely natural function are dispensed from the Cerebellum; moreover also the plenty of both sorts of spirits, so the very instincts of beginning those actions have their conveyance through the Nerves.

It is a quare of
what kind the
actions of
breathing are.

Notwithstanding here ariseth a doubt, to what kind of moving function, viz. whether spontaneous, or merely natural, the actions of breathing ought to be referred; also of what original, viz. whether of the Brain or Cerebellum, the animal spirits appointed to that employment, are. It is manifest enough that this function is in a sort partaker of a spontaneous motion, because it is in our power one while to shorten its exercises, at other times to prolong, and otherwise diversly to alter them, yea sometimes a little to restrain them. Moreover the nerves belonging to its chief moving Organs, viz. the Diaphragma and Muscles of the breast, springing from the nerves of the Arms and Loyns, do owe their descent to the Brain, and do plainly acknowledge the spirits they contain are chiefly ordained for voluntary motions; but moreover on the contrary, this function is so far natural, that its organs do reciprocate the constant changes of Systole and Diastole in sleep, without our notice, and while we wake, we not perceiving it: Moreover although we can for some little time stop its exercise, or at our pleasure vary it, yet we deny it to be altogether or long suspended: besides, although the nerves appointed to the muscles of the Breast and Diaphragma proceed from the spinal nerves, yet these latter coming from the branches belonging to the arm communicate in their progress with the slips of the intercostal nerves; moreover, all the other nerves (which belong to the Cerebellum) arise from these, which are spread about through the Trachea and Lungs.

It is concluded
to be a mixt
act.

From these it plainly follows, that the power of breathing is as it were a mixt action, and doth participate of either moving function, viz. as well of the spontaneous as natural; and that the spirits and nerves of either Province are employed in this duty, which proceed as well from the brain as from the Cerebellum; and truly so it ought to come to pass according to the animal government: for although some actions of breathing necessary for the preserving life ought to be constant and perpetual, there are yet many other motions of the breast and lungs only occasional, and to be perform'd at our pleasure, as may be discerned in laughing, crying, singing, hollowing, whistling, and other singular offices of the lungs and wind-pipe; in which works that they may be done strongly, the muscles conspire together, and endeavour jointly. As in violent labours and exercises of the whole body, by which the blood being stirred up doth want the greater ventilation, the arms being vehemently moved also do force the muscles of the breast, and other pneumonic organs, into more speedy motions for a more frequent breathing. And truly for joint labour of this sort of the Arms and Diaphragma, the nerves serving this motion proceed from the nervous branches of them. Moreover, it is provided for this purpose, lest the exercises of the body might enfeeble at any time the strength of the lungs, or exceed the order of breathing; for when its organs labour more difficultly, or begin to be weary, the nerves of the Diaphragma do warn the other nerves of the arms, plucking them and as it were admonishing of their duty to desist from an over intense motion.

For

For whereas the function of breathing is ordained for many uses, whereof some are merely natural, and others spontaneous or violent; therefore the spirits and the nerves which proceed and have their government as well from the brain as from the *Cerebellum* ought to be joyned together, and to afford their social endeavours; yet on that condition, and as it were by mutual agreement, that one give place to the other by turns for the discharging all works chiefly necessary, or convenient, and do mutually obey. From the pneumonick nerves, the instinct of ordinary breathing or meerly vital beginneth, and is presently communicated to the nerves of the Diaphragma, and from thence to all of the *Thorax*; so that presently all the moving parts agree together in the action, and cause the Systole and Diastole of the breast in such sort as are required to the present state of the blood; notwithstanding on the contrary, as to other actions of breathing, whether spontaneous or violent, it seems to have them also, viz. the instinct or first force of these, beginning one while from these muscles, another while from them is presently communicated to all the other Organs; so that it is called upon by a working consort of all together sooner than the twinkling of the eye, for the performing the designed acts of breathing.

What we have hitherto declared about the Organs of Breathing and their functions and uses, that they may more clearly be manifest, it seems to be material to expose to your view the forms of some of their chiefest parts described to the life, together with the explication of their Figures: yet it seems proper first to insert a few things concerning the Lymphæducts and interspaces of the Lobes omitted in the former Discourse.

The most renowned *Malpighius* first discovered these little Lobes of the Lungs and their interspaces; but to what uses they serve he hath not clearly enough shewed. Haply it may seem that these little places and empty spaces within the Lungs, are certain receptacles of the air (that there may be a larger store of it.) Notwithstanding it is evidently manifest upon experiment frequently made, that the air pufft into the Pipe of the *Trachea* (which is the only entrance into the Lung) doth not enter or blow up these interspaces of the little Lobes: notwithstanding if you blow into the hole of any of these interspaces, immediately all these spaces pufft up do swell in the whole lobe of the Lungs, so that all the little lobes distinct by great interspaces, will appear with a pleasant prospect; as is expressed in the second Figure of the third Table. Moreover the Lymphæducts creeping through the superficies of the Lungs, seem to be every where included in little Membranes covering those interspaces, and to end in them. But as the lymphatic Vessels are all furnished with little valves, so those which appertain to the Lungs are furnished with almost infinite; as is to be seen in the warm large lobe of an Ox, and expressed to the Life in Tab. 1. d, d, d, d.

That I may dare to conjecture concerning the use of these things; it is probable, that those cavities intercepting each little lobe, do receive the vapors flowing copiously every where from the blood being kindled, (when they cannot any where else be better thrust down or separated) which sweat through their slender Coats into these cavities out of the ends of those Vessels, and thence being forced further, they are condensed into water to be carried out of the Lungs through those appropriate Vessels: moreover lest the Lympha's caused from vapors within those passages, and so being made thick, should whirl again back into the Lungs (which would bring great prejudice to them) the thickest obstacles of the valves do hinder. For I have frequently admired what becomes of the vaporious steams which incessantly flow in great plenty, and sometimes most impetuously out of the blood burning ardently in the *Præcordia*. For although very many of them fly away through the passages of the *Trachea* together with the air while we breath, notwithstanding one only way of passage or particular sluice doth not suffice to them, from every place breaking forth: wherefore these little places or empty spaces are every where placed, that they may receive those vapors shut up in the lungs, and may drop out the same immediately condensed through the Lymphæducts, as if through so many noses of an Alembick.

The lymphatick Vessels having their passage out of the Lungs incline towards the passages of the *Thorax* with their numerous branches, and are for the most part mingled with them; but they climb upon the *Oesophagus* in their way, as also the trunks of the *Trachea* and the *Aorta*, and do lose many slips in them by a various insertion; likely for this cause, that some of the lymphatic humor may be bestowed for making slippery the sides of those Vessels.

PHAR. Part. II.

The nerves of the lungs some rulers of the natural motion and others of the voluntary.

Both do alternately obey one the other, and agree in their office.

The interspaces of the little Lobes have passage one into the other, and from thence into the Lymphæducts.

Which therefore is done, that the vaporious steaming of the blood being received by the interspaces, and condensed into water in the Lymphæducts, may be conveyed out.

The progress and distribution of the pulmonary Lymphæducts.

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Part. II.

The Explication of the Figures.

THE first Table shews one entire Lobe of the Lungs, upon whose superficies the Lymphaducts are seen spread through every where.

A. The Orifice of the Trachea being cut lying in the midst of the Vessels.

B. The Orifice of the Pneumonic Artery lying under.

C. The Orifice of the Pneumonic Vein placed above it.

d, d, d, d. The outer Lymphaducts spread abroad through the superficies of the Lobe.

e, e, e, e. More Lymphaducts meeting on the back of this Lobe, from whence they pass into the Thoracic ducts.

The second Table shews one Lobe of a Sheeps Lung cut in the midst, that the upper part (wherein is the trunk of the Vein) being removed, and the trunk of the *Aspera Arteria* laid by itself, the branching of the Pneumonic Artery is shewn throughout its whole frame, viz. through the small and least little Lobes. All the passages of this, viz. the slips and twigs how small soever, being filled and coloured by any liquid thing cast into them, and drawn to the life.

A, A, A, A. The nether half of the Lobe divided, containing the branching of the Pneumonic Artery.

B, B, B. The Trunk of the Pneumonic Artery belonging to this Lobe.

C. A hole from whence its other branch was cut off and removed.

D, D, D, D. The Trunks from which its other branches (because they could not be expressed in this Table) were cut off.

E, E, E, E. The arterious stems thereof stretch forward into length, the side-branches on both parts stretch out into the right and left side.

F, F, F, F. The twigs and lesser slips, which arise every where intermingled with the like from the Veins and Bronchials; and at last woven together with the Veins, every where compass the orbicular little Bladders, and bind them as in were in clusters.

G, G, G, G. The Bronchial branches, which being cut from the stem of the Trachea laid aside, and entering secretly into this Lobe of the Lungs, are accompanied with branches that bear blood.

H, H. The stem of the Trachea appertaining to this Lobe, which lay upon the Pneumonic Artery, cut and laid aside.

I, I, I, I. The stems of the Bronchial branches, which are immersed partly in this portion of Lobe described G, G, G, G. and are partly distributed in the other half cut off.

The first Figure of the third Table expresses one Lobe of the Lungs, according to the branchings of the *Aspera Arteria* divided into lesser and less Lobes, the twigs and slips of which Vessel being filled by a liquid first injected; and afterwards separated from among themselves towards the little Lobes, are also drawn to the life.

A. The Trunk of the *Aspera Arteria* being cut from the rest of its body.

B, B, B. The inner part being cut open, that as well the holes leading into all its branches, as its straight muscular Fibres, are viewed together.

a, a, a. The above-mentioned holes leading into the every where stretched out branches.

b, b, b. The straight muscular Fibres, upon which the other circular do lie.

C, C. The upper part of this Tracheal stem being whole or shut, what the Ring-like Gristles might appear.

D, D, D, D. The branches of the Trachea constituting the lesser lobes, and whole and shut that the Ring-like Gristle may also appear in them.

E, E, E, E. The like branches being cut open, that the holes and straight muscular Fibres may be seen together.

F, F, F, F. Their trunks from which the Tracheal branches being cut off are removed, that there may be space afforded to the rest when cut open.

G, G, G, G. The secondary little Lobes lying upon the trunks of the Bronchials, grapes, which also may be divided into lesser Lobes, the more inward passages of all which pass out of the Bronchii into the little bladderly Cells.

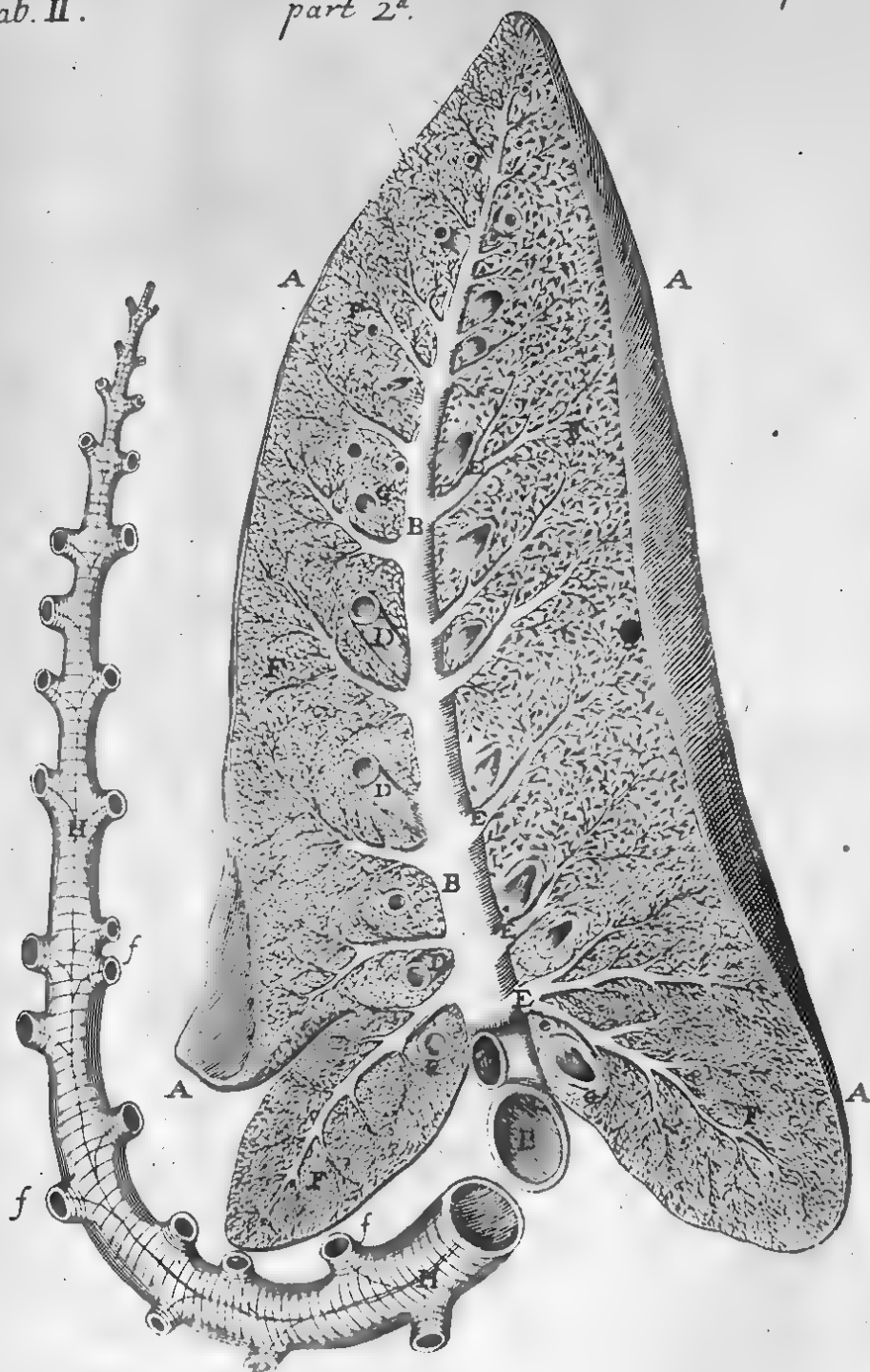
h, h, h, h. The vessels bringing blood crawling over the superficies of those little Lobes.

The second Figure of the third Table expresses a part of the pulmonary Lobe, where-
in

Tab. II.

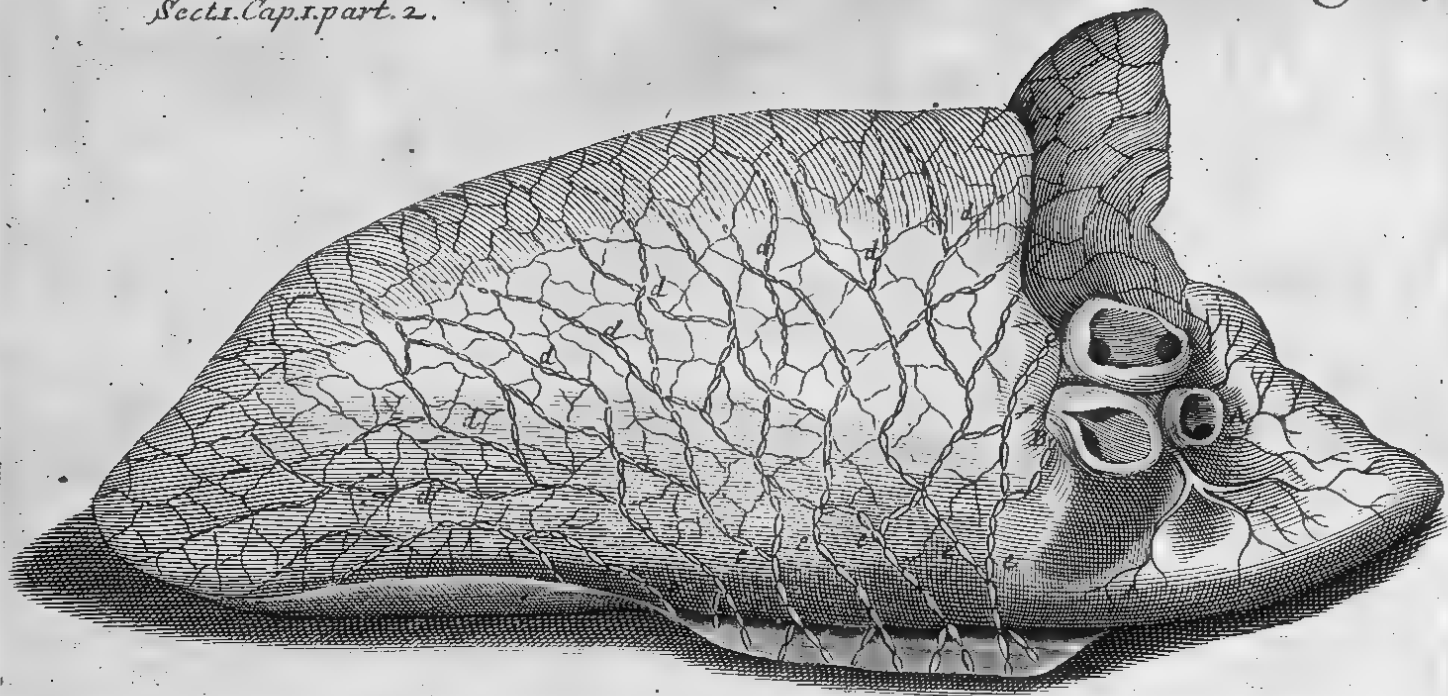
part 2^d.

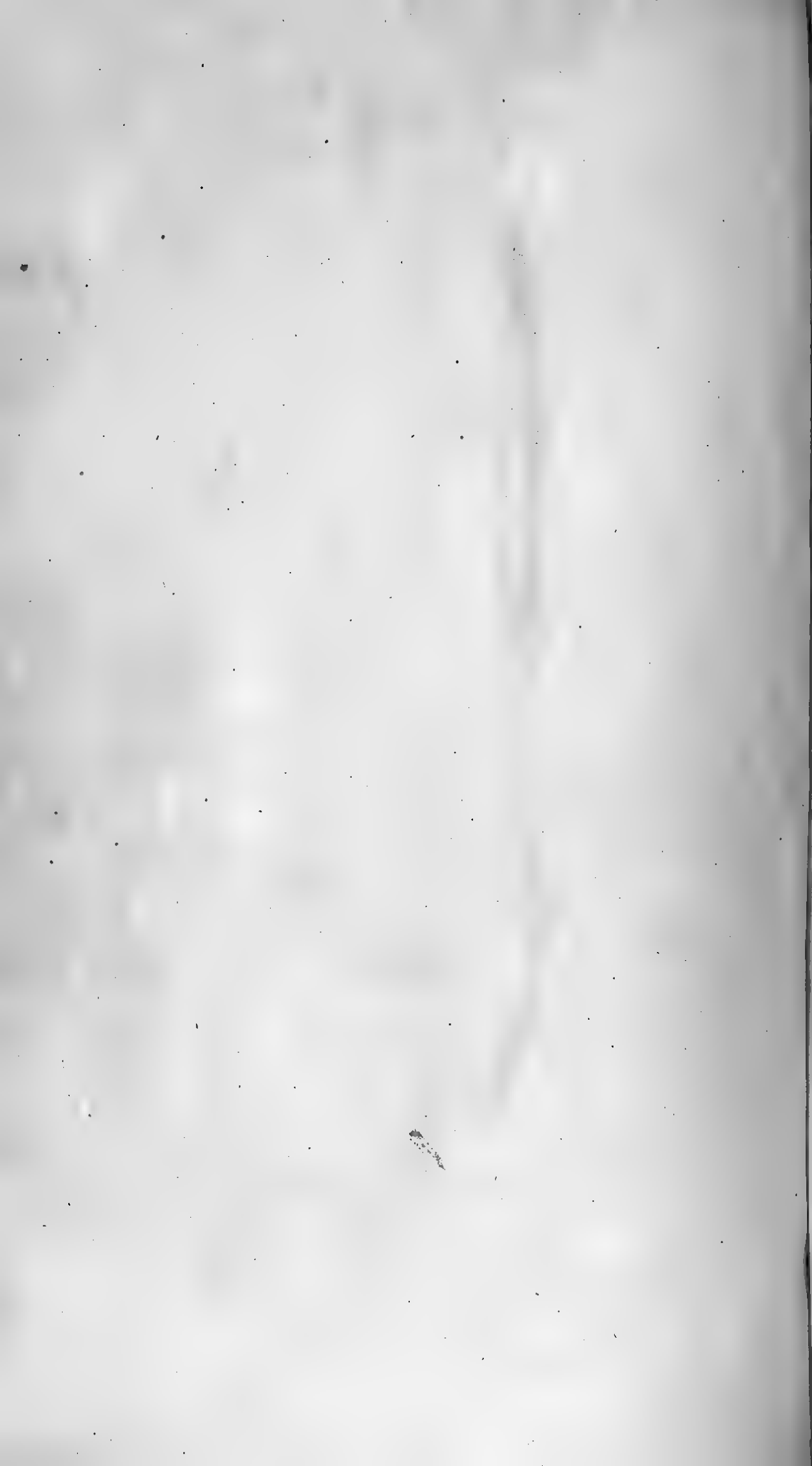
Sect. 1. Cap. 1. P. 14.

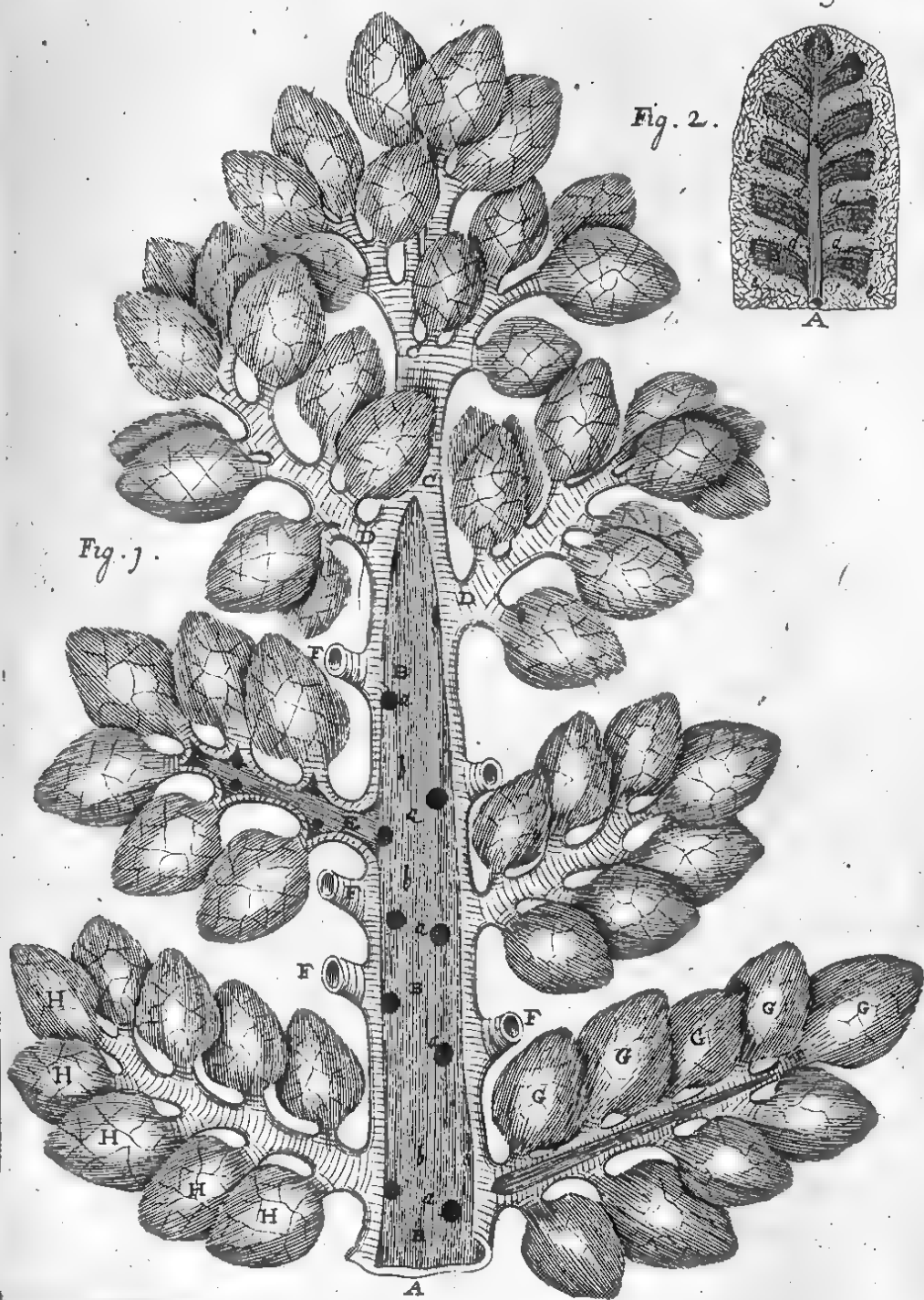


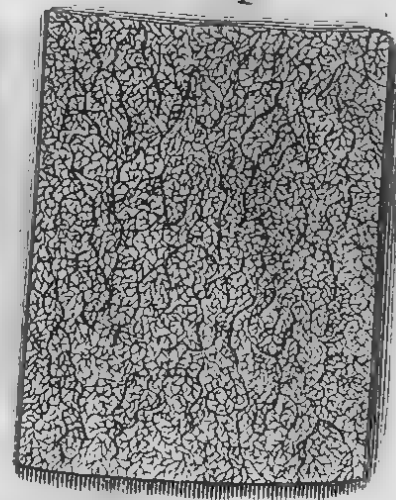
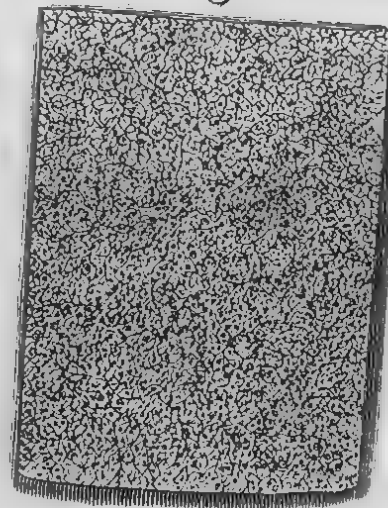
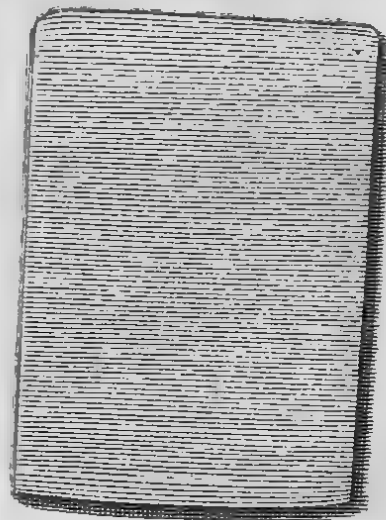
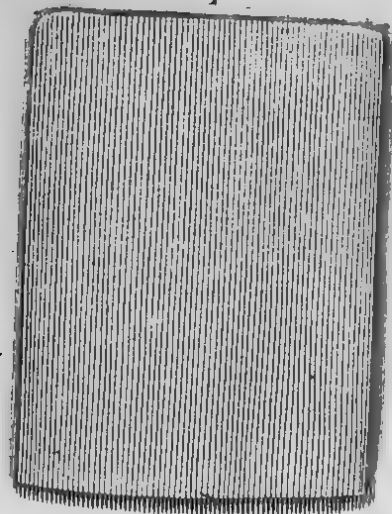
Tab. I. *U. y. R. 14.*

Sect. 1. Cap. 1. part. 2.

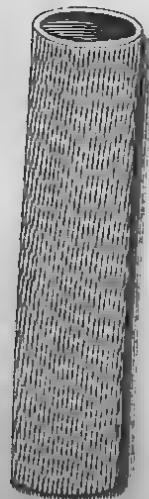








1



2



Fig. 2.

3

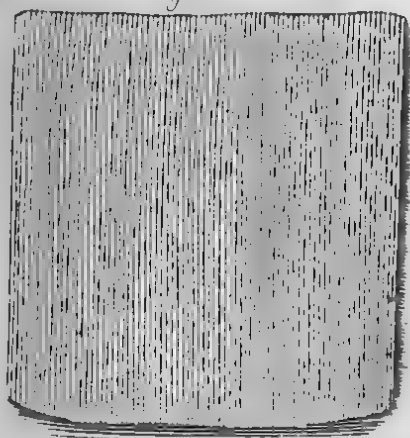


4



Sect. 1. Cap. 1.

Fig. 1.



Tab. VII part 2^d.

Fig. 2. E. 22. P. 15.

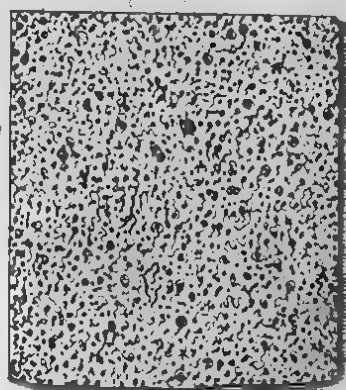


Fig. 3.

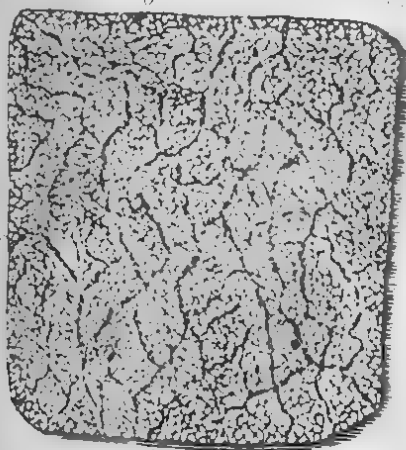
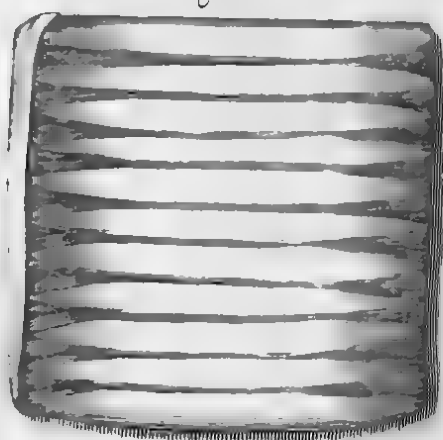
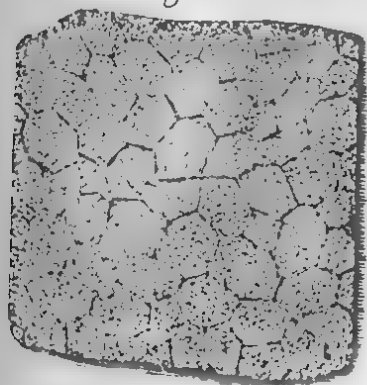


Fig. 4.



Sect. 1. Cap. 1.

Fig. 1.



Tab. VIII part 2^d.

Fig. 2.

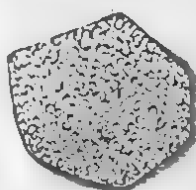
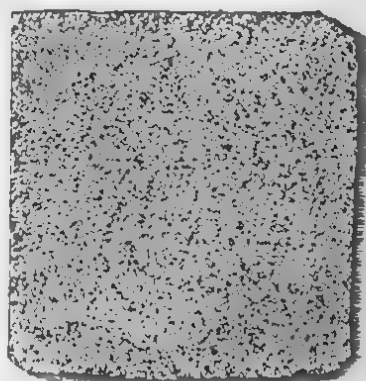


Fig. 3.

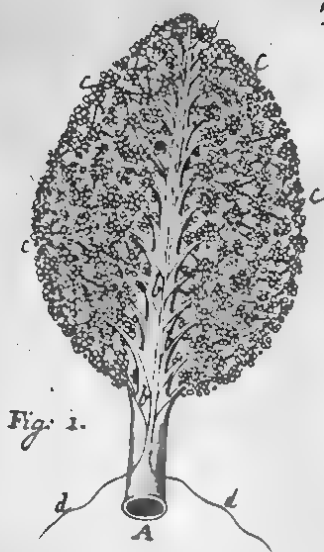




Tab. IV.

Bbb. P. 15.
Sect. 1. Cap. 1.

part 2^d.



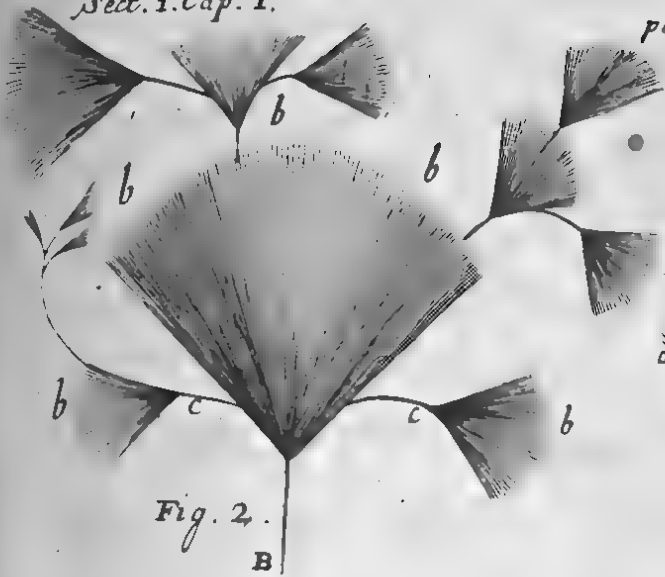


Fig. 2.

B

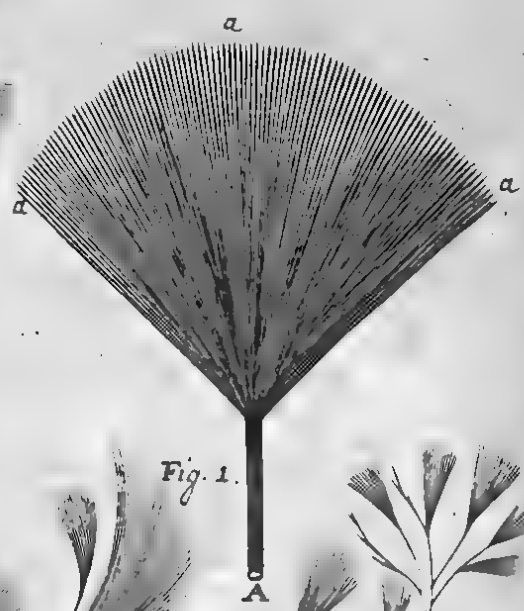


Fig. 1.

A



Fig. 3.

B

In the membranous interspaces being blown up, all the little Lobes appear in their proper figure, and do somewhat represent the leaf of Polypody.

P H A R
Part. II.

- A, A. A part of the Aspera Arteria complicated with the other Vessels, to which trunk made up of all those, the little lobes grow like leaves of a tree.
 b, b, b, b. The little Lobes themselves.
 c, c, c, c. The Vessels bringing blood creeping through them.
 d, d, d, d. The membranous inter spaces of the little Lobes, which also are covered with e, e, e, e, the Vessels bringing blood.

The fourth Table expresses as well the Vessels belonging to the Trachea as those bringing blood, separate and distinct one from another, constituting one little Lobe, as also the peculiar framing of every one of them.

The first Figure represents the separating into divers parts the Tracheal branch distributed into one little Lobe, and the branching into Pipes and orbicular little bladders.

- A, A. The trunk of the Asperia arteria, in the superficies whereof the ring-like gristles do appear.
 b, b, b, b. The lesser branches going from that trunk, wherein also little Rings appear.
 c, c, c, c. The passages of those branches into orbicular little bladders, which seem like the clusters of Grapes.
 d, d. The Vessels bringing blood, distinct from the Pneumonic which cover the Trachea, and serve to nourish it.

The second and third Figure shews distinctly the equal branchings of the Artery and Pneumonic Veins within the same little Lobe; both which being complicated with Tracheal Vessels, do for the most part make up the texture of the pulmonary frame.

The fifth Table sets forth the pulmonary Nerve more accurately described by the aid of a Microscope: so that it plainly appears that the Trunk is as it were a bundle of innumerable little Fibres bound together; Moreover its Trunk, while it creeps into the Lungs in the likeness of Mother of Time, doth spread the various little sprigs every way.

Fig. 1. resembles a part of the nervous trunk cut away, one end whereof being opened and lookt on by a Microscope, seems to unfold it self almost into innumerable little fibres.

- A, The Trunk of the Nerve.
 a, a, a, a. The little Fibres divided from one the other about the end cut off, and spread abroad.

The second and third figure do shew some fibres as well of the trunk as of every branch, and moreover the slips of the little twigs from divers stemmes often repeated.

- B. The chief trunk.
 b. b. b. b. The little fibres about the extremity cut off explicated.
 c. c. c. c. The little twigs springing from the bundles of the little fibres.

The six Table first sets from the anatomy of the Artery bringing blood drawn in apt figures, which we have described in a late treatise.

The first and upper figures hereof, represent the four distinct Coats of that Vessel, viz. the nervous, muscular, glandulous, and the vasculous.

1. The first inward nervous coat, which perhaps is somewhat musculous, consisting of streight or long fibres, which being contracted shorten the Pipe of the Artery.

2. The coat properly muscular, consisting of a heap of small circular fibres, which when they are contracted successively under the stream of blood, do make its circuit to be shortened. It is from the motion of these that the arteries beat.

3. The glandulous coat, which (like that in the guts) being placed over the musculous coat, is weaved together of very small and most numerous glandules.

4. The outward vasculous coat, which variously folded together and wreathed, of Vessels bringing blood, and with slips and nervous fibres, seems like a certain little net.

The second and lower figures of the sixth Table, do shew the anatomy of the Vein, or its four coats expressed in fit places; which Coats do appear entire as successively taken one part from the other (beginning outmost.)

1. The

PHAR.
Part. II.

I. The outward coat consisting of nervous fibres (which perhaps are somewhat muscular) and as it were streight or stretch'd out in length, although not orderly.

II. & III. The vasculous and glandulous coat, which are the same as in an Artery.

IV. The most inward muscular coat, consisting also of circular fibres as in an Artery, which being contracted behind the stream of blood, hastens its returning course.

The seventh Table expresses the distinct Coats of the *aspera arteria*, and separated one from the other.

The first figure shews the most inward Coat, endowed with streight or long muscular fibres.

The second figure describes the glandulous coat, and the third figure the vasculous coat (which are almost the same as in the vessels bringing blood, and also in the Guts.)

4. The fourth figure expresses the outward coat (which is partly cartilaginous, and partly muscular.) The transverse or annular fibres hereof do fill up and weave together the interspaces of the Cartilages.

The eighth Table shews a part of the utmost pulmonary Coat covering over its whole frame, most finely and curiously described by the help of a Microscope.

The first Figure shews a portion of the above mentioned coat, which partly by reason of the extremities of Vessels of every sort ending in it, seems pricked full of holes as it were, and partly from the complications of the vessels bringing blood, which like the twining sprigs of Vines gird about the orbicular bladders, is distinguished into many irregular Area's.

The second Figure represents a part of the outermost membrane separated from the clusters of vessels pull'd off, and without any Area, only markt with little holes as it were with small pricks.

The third Figure expresses one singular area of the Coat above mentioned, augmented in largeness by the help of a Microscope.

SECT. I. CHAP. II.

Of the sundry kinds of Breathing hurt, and their causes, with the accounts of their Symptoms.

Hitherto we have strictly viewed the Lungs, and the parts any way serving their motions, and consequently the vital function; which being many and different, and the provision of the Organs as many very accommodate to breathing; so the same are many ways in hazard to be perverted or vitiated, upon sundry occasions. Truly a Watch framed with the greatest artifice with a Spring, with wheels plain and toothed, with chain and ballance, is not more prone or easie to be obnoxious to depravation than this Pneumonic machine of the breast, through which by sucking in air we preserve the vital flame of the blood with its motion and heat. For whereas the vessels of the Lungs belong to the function of breathing, viz. the *Trachea*, with the *Bronchii* and little bladders; also the heart with arteries and veins, besides which there are nerves with fibres as well muscularous as nervous, Lympheducts and Glandules; also the contents of these Vessels, viz. Air, the old and fresh blood, with its *Serum*, the *Lympha*, and the animal Spirits; any fault happening in any of these doth oftentimes discompose the whole Pneumonic function. Nor less also the moving Organs of the breast, viz. the muscles with the *Diaphragma*, and the nerves appointed to their use. And likewise sometimes the animal spirits before they enter into those nerves, being ill disposed, often cause great disorders in breathing.

The organs of breathing being hurt, the breathing is hurt also.

The uses and ends of breathing which use to be hurt.

When the chief function and uses of the Lungs have been to convey the blood and air through the whole frames of the parts and their inmost recesses, and every their smallest passages, and every where to mingle them; namely for that purpose, that the venal blood returning from its circuit, and diluted with fresh juice, and thereby crude and as it were half extinct, may as well be more perfectly mix'd and wrought together, as more effectually kindled afresh in all its parts by the nitrous air; from hence the chief faults about this business or function of the Lungs do most of all consist in these two things. First, that the blood hath not due passage through the *Sinus* of the heart, and the pneumonic vessels: And secondly, because the Air is not drawn in and breathed out in a due manner into the *Trachea* and its passages.

There.

There are two parts of either of these : For first as to the passage of the blood, sometimes the fault is caus'd within the right *Sinus* of the heart, or the pneumonic Arteries; and also sometimes caused within the pulmonary veins, or the left Ventricle of the heart : Secondly, as to the Air, the failure is chiefly in inspiring and expiring; although each function offends sometimes equally. There are divers accidents of each and many causes and ways of its being done, whereof we will here briefly touch upon the chief.

P H A R.
Part. II.

The defects and failings of the Lung in its office.

Therefore first, when the blood doth not duly pass through the right Ventricle of the Heart and the Pneumonic Arteries, either it happens by its own fault, or by the fault of those passages, and sometimes by the fault of further passages. For sometimes the stream of blood stops in the nether region of the *Præcordia*, by reason of obstruction in the other; moreover, sometimes the defect or fault of the air breathed in stops the free passage of the blood.

First in respect of the blood.

What relates to that fault of the blood, when it passes not quick enough through the right *Sinus* of the Heart and Pneumonic Arteries, the opinion of the Renowned *Sylvius* should here be discoursed, but that it would be too tedious, and from our purpose. For he supposes, *The descending branch of the venal blood, moistned with chyme together with the lymphatic humor returning from the whole body, hath the nature of an acid-sweet spirit; and in the mean time its branch ascending impregnated with choler from the bladder of the gaul mixt into the mass of blood, does participate of an oily volatile salt; and so by the meeting together of these something contrary to themselves, a gentle and friendly contention or boiling is stirred up in the right ventricle of the heart, in which and for which the fiery parts lurking and being shut up in each, being freed and set at liberty, do rarify the chyle and blood, and so change and alter them, that they exercise the function of life and heat as well as motion and nourishment through the whole body.* There are many reasons why I assent not to this ingenious and neatly-framed Hypothesis. For besides that many do far otherwise determine about the origine and dispensation of Choler, and so not without strong reasons and experiments are thorowly perswaded, (by eye-sight) that there is not any such boiling up of the blood of a different quality, and striving or contending in the right ventricle of the Heart : Our judgment continues still, as it hath been, that both streams of blood, washed thorowly with the fresh chyme, do consist altogether of one kind; and for that cause the milky Vessels of the Chest carry about part of the Chyle so long a journey, which they pour into the descending trunk of the *Vena cava*, just as the *Meseraick* Veins pour the other part into its ascending trunk : also that the lymphatic humor together with the Chyle is poured into the subclavian Vessels, so that it may very commodiously be reduced into blood; neither truly doth there seem need of other or more passages. Moreover we determine that that humor rightly constituted doth agree with, and is easily assimilated to the mass of blood, as well as the Chyle it self made sweet, without any contention raised in the heart. But if the lymphatic humor returning from the Brain and nervous kind as well as from the Glandules, degenerate from its due temperature, and contract a sowness (as it often comes to pass) then being re-infused into the venal blood it overcomes it, and precipitates it into ferocities, and from thence great streamings of urine do ensue. Moreover we have shewed elsewhere, that the Diabetes is provoked from such a cause. But such a flux of the lymphatic humor is so far from exciting a greater boiling up of the blood in the right ventricle of the Heart, that rather on the contrary from thence often chilness of the whole or stiffness, with a weak Pulse, and sometimes swoonings or convulsive fits are provoked, accompanied with a plentiful and pale urine. The reason whereof without doubt is, that then the clear humor flowing from the brain and nervous parts, turns the blood into ferocities, and cools it by too much diluting; and for that cause the animal spirits being destitute of their vehicle, either faint or run into irregular motions.

The opinion of the famous Sylvius concerning the blood fermenting in the Lungs.

Which seems not likely to be true.

Our opinion hereof.

But truly as we altogether deny an Elastic effervescence of the blood in the right Ventricle of the Heart from contention of dissimilar parts; so as often as from thence the blood is not cast out into the Lungs after a due manner, we determine it to happen not so much from the proper fault and defect of the blood it self as from the animal faculty. For if the spirits actuating the moving Fibres of the Heart, either grow weary, or are forced into convulsive disorders; for that cause the Heart beating in disorder, drives out before it the blood either infirmly or irregularly.

The pneumonic circulation of the blood is stop'd sometimes by the fault of the heart it self.

But that the blood issuing out of the Heart doth not always with expedition pass through the Pneumonic Arteries, that sometimes happens from its own proper fault, and also sometimes from the passages obstructed, and also by reason of other causes. The blood it self in a double respect hinders its own passage through the Lungs, viz. either offending as to its kindling, or as to its temperature. There are sundry accidents of either of these. For first, even as the blood is more or less kindled than is convenient

2. Sometimes by the fault of the blood.
3. Sometimes by reason of passages obstructed.

PHAR.
Part. II.

The blood hin-
dred in the
Lungs sometimes
because not kin-
dled enough;

Sometimes too
much.

It is also stop-
ped through its tem-
perament being
vitiated.

When the blood
is too much loo-
sened in its con-
sistence.

Why it lodges
the Serum in the
Lungs.

The various cau-
ses and ways of
doing it.

venient, it is hindered or obstructed in the pulmonary circuit: if at any time the watry, earthy, or fixt saline parts are predominant in the blood, the spirit and sulphur being consumed or brought low; by reason hereof its liquor being not well or less kindled by the nitrous air, is not easily rarified in the pulmonary passage, and scarce passes through them like a flame of its own accord, but it sticks still in its passages, heavy and muddy, and creates much trouble and labour to the Heart wheresoever it is circulated. Hence as often as the blood is a little more plentifully forced into the *Præcordia* by the quicker motion of the whole body, or of its parts, the Heart and Lungs labour hard for its driving about, and that with the utmost endeavours. And in this case it is probable, that the blood carried more rapidly into the right Ventricle of the Heart, doth somewhat stagnate; because it cannot presently be carried into the passages obstructed before it. Moreover from this cause those grampous or fleshy concretions called the *Polypi* of the Heart sometimes seem to arise. Hence both in the *Pica*, *Leucophlegmatic*, *Dropsie*, and in *eterate Scurvy* from the quicker motion of the body arises difficult and painful breathing.

2. Sometimes the blood is too much kindled, and breaking out almost into a flame, and being above measure expanded, it can scarce be contained in the pulmonary passages (which it very much blows up and extends) but endangers them to be inflamed or kindled; wherefore lest it should tarry longer in them, the *Præcordia* beat with most frequent and strong endeavours, that the blood so over-much kindled might be ventilated and circulated: for otherwise it being carried within the Lungs and inflaming them all over, would quickly destroy the vital function.

Besides these things which concern the kindling of the blood, there are other faults as to its temperament or mixture, by reason of which it less freely or expeditely is conveyed through the pneumonic passages. For when its consistence is either too laxe or too close, it will not easily pass through the small passages of the Lungs; but oftentimes is in hazard to stick and stagnate in them, and also run out and be extravasated.

The blood being in a diverse manner made loose in its consistence, either deposits its Serum, or its dregs, or its putrefaction in the Lungs; which being lodged in the recesses of the Vessels, or affixed unto their sides, do variously stop or pervert the course of the blood.

1. The dissolution of blood, which is most commonly injurious to the Lungs, (although not very dangerously) is wont to happen, for as much as the serosities being unapt to be contained within the mass thereof, and when they are not presently sent away by sweating or urine, they separate from the blood within the Lungs; and so boiling up, and breaking out from their proper vessels, do as well disturb and stop the passage of air, as that of blood; so that for the sake of expelling those serosities and continuation of the circulation of blood, the Lungs are provoked into a frequent and very troublesome Cough. What the formal reason of this Cough is, and the manner of its being brought about, we shall declare hereafter.

Though there are many causes and occasions, by which the serous liquor, departing from the loosened consistence of the blood, flows out abundantly into the Lungs; yet for the most part it happens from one of these three, *viz.* first and most frequently, because the Pores outwardly bound up by cold, cast back the serosities which were wont to be sent away by perspiration, into the mass of blood; which compel it presently to boil up, and cast off the serous superfluities in the Lungs. From this kind of cause *Catarrhs* and Coughs frequently arise, insomuch that the beginning of every cough by the vulgar is always imputed to such an occasion, to wit, catching cold. 2. The drinking of sharp and thin liquors, as Cider, Rhenish Wine, white Wine, *Paris Claret* commonly causes to some a Cough, or catarrhal distemper: the reason whereof is, for that the blood, weak in temperament, is presently dissolved and precipitated into serosities like milk by fowre things cast into it, which flow plentifully from the mouths of the inward Arteries. I have experimented this upon my self yearly, when in the Summer season (when the blood abounds with sulphur) I have drank Cider and tartish Wines safely, yea frequently to advantage, the same in winter (when the blood is prone to fowreness) but moderately tasted of, do presently provoke a Cough. 3. There is another cause of this serous inundation flowing out upon the Lungs, *viz.* when the *Lympha* watering the nervous and solid parts, doth suddenly suffer a flux; and for that cause it streams back into the blood out of the Fibres and Glandules, and other passages and receptacles; whose liquor it presently dissolves, and precipitates into serosities, which often infects the Lungs.

For this reason a sudden and troublesome Cough frequently accompanies convulsive distempers, which being commonly called a vaporous Cough is ascribed unto vapours. Moreover in great alterations of air, especially when the season varies from dry into moist,

moist, and the volatile and fixed salts do thereby melt, the Cough and Catarrhs increase very much. P H A R.

Part. II.

Neither doth the serous liquor only, but also many other humors or recrements of the blood lodged in the Lungs frequently stuff up their passages; so that by obstructing both the passages of air and of blood, they cause difficult breathing or a cough. This is every where perceived in ill-habited bodies, also in Gluttons and Drunkards, and others leading an inordinate and sloathful life. Wherefore Foot-men use a thin and spare diet, that they may have their Lungs free from the filth and recrements of the blood. I have observed some melancholly persons, the adust faces abounding in the pulmonary passages, to have voided blackish spittle like ink; also others cholerick, and inclining to the Jaundice to void yellow, and sometimes very bitter, as if it had been meer choler.

3. Moreover many instances manifestly declare, that sometimes the Lungs are tainted by the corruption and putrefaction of the blood. For the blood, toucht with an infection or a pestilent or venomous contagion, begins to be corrupted, and withdraw into clotted and corrupted portions; from thence the Lungs undergo the chief taint, from whence the greatest danger of life is threatned. This is too well known in the Measles, small Pox, Plague, and malignant Feavers, for me now to undertake to explicate it: by which maladies as often as the sick die, it seems to come to pass, either because the blood clodding in the vessels of the Heart or Lungs, obstructs the way of its proper course, so that presently its influx into the Brain is hindred, or because the corruption of the blood, affixt to the sides of the pulmonary passages, causes a Phlegmon as it were; and therefore provokes a most troublefom cough or difficult breathing, and frequently bloody spittle. So much for the impediments of the circulation of the blood, which happen in the Lungs by reason of the mass of blood too much dissolved, and apt to depart into parts and portions, (which being there left obstruct their passages.) There remain other no less prejudices to the *Præcordia*, which proceed from the consistence of the blood too much bound up together, and sending nothing from it self: by which a burning Feaver, Plurisie, or Peripneumony arise.

The blood dissolved also lodges in the Lungs infections that cause corruption.

In the former distemper the blood being more sulphurous than it ought, and therewithal being thick, is not diluted enough with its Serum; and those particles of it contained within it self, it puts away with great difficulty: wherefore it is more plentifully kindled in the Lungs; and when it passes through the passages hereof with more difficulty, by reason of its greater boiling, and its thickness, the Heart beating quick and most vehemently, endeavours its circumpulsion with all its might; notwithstanding from its greater flame growing hot within the *Præcordia*, heat and a most troublefom thirst, with roughness, and as it were a certain parching of the tongue arises.

The blood is hindered in the Lungs by reason of the too thick consistence of the blood;

As is perceived in a Feaver.

In the other kind of distemper, viz. a Pleurisie and Peripneumony, the blood is alike thick, but less sulphurous, and inflammable; wherefore it doth not participate of such a burning: yet by reason of its thickness it doth not so easily and quickly pass through the Chest or Lungs, is frequently extravasated, and sticking to the inter-spaces or sides of the passages, causes obstructions, and soon after an inflammation, to which pain often succeeds with bloody or discoloured spittle. We may observe in blood-letting in these kind of distempers, that after it hath settled, its superficies is covered with a little whitish Skin, or otherwise discoloured, but always with a thick and viscus: the reason whereof is, that the blood, when it doth not send away in the circulation its old particles, nor doth admit enough of new, it is thickned with a continual boiling, and like boiled flesh changed from a bloody colour into a whitish; in which state, passing with difficulty through the small passages of the vessels, it is in danger to be extravasated, and easily provokes a Pleurisie or Peripneumony.

In a Pleurisie and Peripneumony.

Besides these stoppages of the Blood, caused by its own fault, while it passes through the *Præcordium*, there are also other impediments, which happen either by the defect of the Heart, or its passages, or by the fault of the air inspired. By what means and for what cause the Heart offending in its motion, forces the blood from its right Ventricle through the Lungs into the left irregularly, we have clearly shewn in our late Tract of Cardiac Distempers: to wit, that muscle sometimes labouring for want of spirits doth not vigorously and strongly enough perform its beatings. For when in corporal exercise the blood more plentifully than usual, is forced from the *Vena cava* into the Ventricle of the Heart; if this cannot firmly contract it self, labouring according to its strength, it causes frequent and weak Pulses: moreover to help this as well the Pneumonic Arteries, as others in sundry parts of the body, which drive about the blood every way, do cause frequent and inordinate contraction. Thus I have observed in Virgins afflicted with the Green-sickness, and in other cachectical bodies, from a quick motion of the body, not only a palpitation of the Heart, but in the neck, temples, and other places

The blood is hindered in the Lungs by the fault of the heart.

1. When the spirits thereof are wanting.

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2. Because moved inordinately.

3. The blood is hindered from obstruction of the passages. Which are shut up divers ways. For divers causes here rehearsed.

The bronchial Pipes are filled.

Sometimes wax hard.

The vessels are stuffed with concretions resembling the Polypus.

The blood is also hindered because the passages are burst asunder, as in spitting blood.

One impediment of the blood is want or default of air.

ces the Arteries to have beaten irregularly. Neither is it the want of spirits only, but their disorder is sometimes the cause that the *Præcordium* doth with less strength convey the blood; for sometimes the spirits, the inmates of the Cardiacal nerves, being stirred up by an incongruous conjunction, and affected convulsively, do impress their irregular contractions upon the Heart or Arteries, whereby the progress of the blood is several ways perverted or hindered, as it often happens in Palpitation of the Heart, Trembling, intermitting Pulse, and other the like passions.

3. The Pneumonic process of the blood is variously stopt, because the passages are not open enough: which impediments happen often as the Pores of those passages are either stopt or broken. Of the former there are two reasons: viz. sometimes the ways are shut, for as much as the passages of the vessels, contracted by the carneous fibres, are brought nearer one another; as we have elsewhere shewed, doth sometimes happen in Palpitation of the Heart, and a convulsive Asthma. The effects of which sort, by reason of the stream of blood shut within the *Præcordia*, difficult or hard breathing, a small Pulse, and chilness of the whole body are wont to accompany. Moreover sometimes the course of the blood is shut up, because the passages of the vessels are pressed together by a body, or by some humor from without: wherefore when the little Cells or bronchial Pipes (as is usual) are filled with a viscous slegm, purulent matter, or blood extravasated, as the free passage of the air is hindered in them, so also the passage of blood is stopt in the vessels adjoining. On the same account come tumors, little swellings, worms, also stony, sandy, and curdly concretions, and others of another kind are in diverse manners excited; the chief whereof we shall touch on hereafter. Moreover we sometimes see the canals as well of an Artery as of the Pneumonic Vein, made very bony in some part, and their sides so compressed, that a very small chink remains for the blood to pass. Not long since we dissected a young man who died by reason of an ill formation of the Pneumonic Vein, in whom the Trunk of this vessel growing stony near the juncture to the heart, did stick so close, that the blood did drop into the heart only by drops, or by a very little stream. 2. That the passages bringing blood are often filled and stopt, inasmuch that the stream of blood is obstructed or straitened, many anatomical instances and observations manifestly declare. From thence it appears, that grumous, or as it were carneous concretions of the blood do frequently so stop the ventricles of the heart, and the roots of its larger vessels, that the course of the stream of blood is almost entirely stopt. Moreover reason persuades, and experience concludes this more frequently to happen in the lesser vessels: for seeing (as we have even now intimated) the blood emitted by Phlebotomy in Rheumatisms, Peripneumonies, and Pleurifies, when it is cold is covered all over with a thin skin altogether of the like substance with those concreted Polypus's; it plainly appears, that it passes with difficulty through the passages of the lesser vessels by reason of those viscous excrements: wherefore that it may pass by some means, it distends them very much, and sometimes breaks quite through them, also it frequently unlocks their mouths, and opens gapes into the *Trachea*, inasmuch that portions of the extravasated blood are by coughing frequently ejected. We have known some to have died Asthmatic or short-winded, whose Lungs being free from an Ulcer, or any more grievous wound, have swelled so much, that they wanted room for their motion within the cavity of the Chest: the reason whereof doubtless was, that the thicker and more feculent blood, for that cause not easily passing through those vessels, every where extended the Arteries and Veins, and caused it to stagnate in the lesser Pipes. Moreover the feculencies of blood one while salt of different kinds, another while sulphureous or earthly being combined with them, and thrust into the small passages of the vessels, and fixed there, do altogether obstruct them; inasmuch that the Pneumonic circulation of the blood is contracted into a shorter space, and consequently the function of breathing is straitened in the compressed Pipes or little Cells. There are many kinds and sundry ways of such an obstruction, which if all or the chief should be enumerated, such a Pathology would swell into too great a bulk. 3. The Pneumonic passage of blood is not truly hindered by reason of the passages shut and obstructed, but sometimes also being burst asunder. For those vessels being small, or tender, or very loose in some persons, are frequently opened by the force or acrimony of blood; so that the blood either bursting into the *Trachea*, is ejected by spitting, or heaped up in the interspaces of the passages, causes Peripneumony, or falling down into the cavity of the Chest, produces an Empyema. Of all these we shall treat singly in the Chapter of spitting of blood.

3. There remains as yet a third impediment of blood in the Pneumonic passages, which happens for the want or fault of Air. If at any time the blood is not kindled after a due manner within the passages of the Lungs, from air breathed in by the *Trachea*; for that cause as presently its flame is irregular, so likewise its motion is variously stopt or perverted:

perverted: for although the blood is forced through the Lungs by the meer impulse of the heart, notwithstanding the Pulse hereof is proportioned according to the tenour of its being kindled by the air; wherefore when the flame of blood is diminished, or suppressed, for want or through the fault of the air, presently the Pulse proves languid, or unequal; and by reason of the bloods course being troubled, or stopt, presently a paleness and coldness succeeds throughout the whole body, with enervation of the members. But if inspiration be wholly intercepted or frustrated (because the nitrous particles are wanting) presently the pulse ceases, and anon life is lost. The reason of all which is, both because the blood being much impeded in its ascension, or extinct, like Must given over working presently subsides, and is unapt for any motion; and chiefly because the flame of the blood failing, and being substracted from the brain, presently the Hypostasis of the Animal Spirits, as it were light streaming from thence, immediately fails, and together with it the exercise or actions of all faculties do cease. But if the blood is too much kindled, the Sulphur of the Blood, and the Nitre of the Air running together more than it ought; for that cause presently, that this too much burning may be eventilated enough, the Pulse of the heart is increased to its utmost. We might adde many instances of this kind; but truly this consideration of the blood leads us to the second thing proposed of Respiration hurt; namely that we may duly weigh, what sort of failings or defects do happen about the inspiration as well as expiration of the Nitrous air, requisite for the preserving the nitral flame of blood; that is to say from what causes they proceed, and also what effects they are wont to produce; in which search we will first treat of Inspiration hurt.

SECT. I. CHAP. III.

Of Inspiration hurt.

Breathing is accounted hurt, when its use is frustrated, or any ways hindred; which most frequently happens, by reason of the fault or defect of the Air drawn in. As to the former, if the Air chance to be depraved, it neither duly kindles nor eventilates the blood, yea it sometimes overthrows the temperament thereof, or infects it, as is every where seen in a Constitution of Air very malignant. That we may touch on the chief reasons of these distempers, we are to observe, That as the Nitrous particles of Air are chiefly necessary, (as is manifest by manifold experiment) for the preservation of life; so frequently it happens that Nitre of the Air either to fail or be wholly wanting, or by particles of another kind to be so much muffled, or bound up, that they cannot enough exercise their vital power, or lastly malignant or fatal Corpuscles to be adjoining thereunto. First, the nitrous particles of Air are deficient, if when it stagnating or growing hot the Nitre is chased thence, or not stirr'd into action. Wherefore, in a low-roofed Chamber, or too close, and in other places crouded with assemblies of men, or made hot with the ardor of the Sun, we difficultly or weakly breathe. The same comes to pass in places of great height, on the tops of those Mountains exceeding the top of the Atmosphere; wherein breath is faintly drawn for want of Nitre, neither can we live long there. Secondly, the Nitrous Particles of Air are wont to be obscured or blunted by other accessories, also sometimes they are too much sharpened. For as often as the South-wind blows, the Air is too moist and thick, inasmuch as the Nitrous particles are seiz'd upon by the watry and sulphureous, and are much blunted, so that while it is drawn in, the blood is not vigorously kindled, but like green wood put into fire it rather smokes than burns bright; wherefore during such a state of Air we become stupid and dull, and unapt for motion; but on the contrary, the North-wind blowing; the cooling sharp and most nipping Particles are adjoined to the Nitrous, and the blood is enough kindled, and we breath freely; yet the Vital flame is every where restrain'd by intense frost disproportion'd thereunto, and unless refresh'd by motion and heat, it is frequently and entirely extinguished.

2- Besides these faults of the Air, whereby breathing is wont to be hurt, moreover this evil sometimes proceeds from its defect; inasmuch as it cannot be drawn in plenty enough. Of which effects though there are many and divers causes, yet for the most part it happens in respect of the organs of breathing, either hindred as to their motion, or their passages obstructed.

Breathing hurt by the vicious qualities or defect of air.

The faults of the air.

The defect of air hurting breathing proceeds from the Pneumonic Organs.

the

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Part. II.

1. The Organs of breathing are either meerly passive, viz. which are moved, as the Lungs; or are active, and move themselves, and those together, as the muscles of the Chest and Diaphragma. In every of these the impediments of the motion by which breathing is hurt, happen variously. And first what respects the Lungs, we mention before, that they sometimes very much swell, by reason of the Vessels being much distended, and fill'd with blood, insomuch as being stiff and inflexible, they obey not the turns of the Systole and Diastole of the Chest. Moreover it happens sometimes through a Phlegmon, little swellings, and other concretions of divers forms, that a like stiffness is caused in them. Secondly, the active organs of breathing, or the moving parts, viz. the muscles of the Chest and Diaphragma are wont to be perverted or stopt from their moving function by divers causes. A solution of continuity made in any part of these, either by clotting of blood, or by falling down of the Serum, and other humors, as in the Pleurisie and Scurvy, or in those that are wounded or bruised, doth every where cause pain in the place affected, with impotency of motion and difficult breathing. Moreover, sometimes without pain, or any evident cause, those parts being hindred from their motion do produce a most heavy purfiness; As is frequently seen in an Asthma, Suffocation of the Womb, and in certain other Convulsive or Hypochondriac distempers. The reason of which passion without doubt consists in this, for that the animal spirits appointed to the moving function of those parts, are disturbed about their Origine, or hindered in the passages of the Nerves, and are turned aside from their due influx into the moving fibres: Insomuch as many who are sound enough as to their Lungs, and only obnoxious to affects of the Brain and Nerves, are frequently surprized with horrid fits of an Asthma, as we have at large declared in another place.

2. The stopping of air, hindering breathing, whereby it less freely enters the Lungs, frequently happens, by reason of the Conveyances, viz. the passages of the Trachea being shut, or not enough open. For indeed those passages are wont to be stopt (as we have formerly observed touching the Vessels bringing Blood) and prohibit the full entrance of air, when they are either obstructed or compressed, or more narrowly contracted. Though there are many causes and ways whereby the passages of the Trachea are wont to be obstructed, yet chiefly and most often a Catarrhal distillation of the Serum, while it departs from the blood, and flows out of the vessels bringing blood into these parts; which being first thin and sharp, produces a troublesome Cough; afterwards thickning by digestion, and cleaving to the sides of the Trachea, exceedingly straitens the ways of inspiration, and shortens them by quite stuffing up their extremities. In like manner the sweating out of extravasated blood, as also of Pus or ichorous matter out of the Lympheducts or Veins into the tracheal little bladders, doth frequently produce an Asthma, and often a Consumption; the reason of which sort of distempers shall be more largely explained hereafter. Secondly, it is manifest enough by common observation, that the Tracheal passages as well the last as the intermedial, often-times are straitned, or shut, by compression. For after a plentiful meal, or abundant drinking of Wine or strong Ale (inasmuch as the Pneumonick vessels are very much distended by reason of the turgency of blood, and the sides of the Trachea being press'd together, do not admit of a free and usual entrance of air) men otherwise healthful enough, do breath difficultly and painfully: Which truly we esteem to happen from the Lungs being filled and extended rather, than from a cram'd stomach hindering the Systole of the Diaphragma. Moreover, for this reason, even in the very paroxysms of feavers a frequent and painful breathing is manifest. Neither onely from the turgency of blood, but also from the same stagnating, or extravasated, and also from stony concretions, and divers other manners, the vessels of the Trachea being pressed together, cannot discharge a free breathing.

3. The passages of the Trachea being sometimes more nearly contracted and closed from their fibres convulsively disposed, deny a passage to the Air for due breathing. From hence, when there is no obstruction, or ill conformation in the Lungs, as also no consumptive disposition, yet from those fibres preternaturally convulsed and drawn together, dreadful fits of an Asthma frequently arise. Whereas we have in another place discoursed of these passions, it will not be requisite here again to repeat that discourse. Besides these accidents of breathing hurt, there are certain others which are stirr'd up by reason of the Air prohibited in its first entrance, viz. in the Nostrils, the throat, the Larynx, from a tumour or ill conformation: For the Polypus in the Nose, the Quinzy in the Throat, or inflammation of the Tonsils, do render a difficult breathing; in the same manner as a heap of sand about a Haven, obstructs the ingress and regress of Ships. But truly since the reasons of those passions, and their manner of being made, are exposed to sense, it seems superfluous here to deliver their causes.

The various
ways of Ob-
structions.

A Catarrh.

The swelling of
blood by which
the passages are
press'd together.

The Cramps of
the tracheal
passages.

SECT. I. CHAP. IV.

Of Expiration hurt.

AS Expiration is much easier, and with lesser trouble performed than Inspiration, so it is less endangered to be stopt or perverted, as to its function: for in truth the contractive endeavours of fewer muscles are required to perform that, inasmuch as some do affirm that the meer relaxations of the moving parts, whereby the dilatation of the breast is discharged, doth suffice for its constriction. Hence when in the agony of death, the ultimate labour is to open the breast, and fetch breath, by which the flame of life may be continued; as soon as that endeavour is become frustrate, the animal expires, and is readily extinct. But truly we have already clearly enough evinced, that the tasks of breathing out, no less than those of breathing in, are performed by the help of peculiar muscles. Wherefore, when it happens that the Organs of Expiration are either hurt or prejudiced, there must needs follow difficulty or depravation of that function. The moving parts, which bind together the breast, and straiten the cavity thereof, are especially the inward muscles of the breast, some belonging to the Loyns, and others to the Abdomen; as also the muscular fibres of the *Larynx* and *Trachea*; by reason of some faults, occupying sometimes these, anon them, either single or many together, expiration is wont to be stopt or perverted after a diverse manner. Although the hurt of this function frequently depends upon inspiration being prejudiced; notwithstanding it sometimes happens alone; so that when we suck in Air easily and duely enough, we return it disturbed or perversly, which truly is wont to come to pass through divers causes, and after many manners (the chief of which we shall here briefly touch upon.)

The act of expiration is easier than of inspiration.

Expiration hurt sometimes proceeds from the fault of inspiration.

1. For first, when a wound, or convulsive or paralytical distemper happens in one muscle (which causes expiration) or in more, for that cause the cavity of the *Thorax* cannot be so freely drawn together and compress'd, for the more full breathing out air or breath. Hence not only such as labour in a *Pleurisie*, but in a tumour or wound in the intercostal muscles or the Abdomen, cannot easily cough, or sing, or perform other acts of stronger expiration: Neither is the due drawing together of the *Thorax* less stopt, by reason of the moving fibres of those parts affected either by a resolution, or a cramp.

Sometimes being alone depends on various causes.

1. On the wound of a part moving.

2. The act of expiration, whereas it is variously perverted or disturbed, so it chiefly happens in a cough, in sneezing, in laughing, in crying, and in Hiccough; into the reason and manner whereof we will briefly enquire; And first we shall speak of a Cough.

2. In a Cough.

A Cough may be described, that it is a vehement, more frequent, unequal and loud expiration, stirred up either for the quieting of some troublesome and provoking thing, or for expelling of it out of the Lungs through the passage of the *Trachea*. For air being violently excluded, and dash'd in the way on the sides of the Tracheal passages, whatsoever is in any place impacted in them, if it be easily moved, it discusses and wipes it away, and frequently sends it out of doors.

The description of a Cough.

For the exciting of a Cough, both the muscles contracting the *Thorax*, and also the moving Fibres of the *Bronchii*, do concur in motion with a joyn't force together. For while the muscles straiten the cavity of the breast, and every where squeeze the whole Lungs; these fibres one while contracting these tracheal passages, another while them, closing behind the air while it is driven forwards, do endeavour its expulsion more quick and vehement.

Its formal reason, and the manner of its being done.

A more intense sudden inspiration precedes every act of a Cough, to wit that the air being admitted in greater plenty, may presently be more violently driven out with noise; in which endeavour not only the new that is fresh breathed in, but also the old, being heaped up before in the tracheal little bladders, is driven forth together with a noise, for the encrease of breath blown out; and when what is troublesome is not settled nor removed at the first assault, the vehement expiration of this kind is repeated by a frequent course, even to the great wearying of Nature.

The first cause of every Cough is an irritation of the nerves or fibres belonging to the lungs; concerning the nerves we are to observe, that not only the branches and their slips inserted into the Lungs, but others from which they do arise, or with which they do intimately communicate, being provok'd in places far distant from the breast immediately cause a cough: for which cause oftentimes a sharp humour being lodged

Its primary cause.

within

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Part. II.

within the Brain, and from thence falling down into the little head of the pectoral nerves, is wont to produce a most troublesome Cough or Asthumatick distempers, as not long since we have declared by notable instances. For the same reason a pain inflicted on the nostrils, palate, or *Gula*, provokes a Cough, or rather a vain attempt of coughing. Moreover a little *Serum* distilling from the Arteries into the upper parts of the *Gula* or *Larynx* produces a frequent and very troublesome Cough, without any notable prejudice of the Lungs. But truly this provocation, inflicted on the nerves and fibres distributed in the Lung it self, more frequently, and truly more violently provokes an endeavour of Coughing, which is repeated by courses, till what is troublesome be turned forth, or the provocation restrained. Of this kind of Cough from the nerves, a notable Example shall be after set before you.

The evident
causes thereof.

The provoking causes producing a Cough are manifold, and make their stay in several places: for besides that the nerves, as we but now intimated, and also the membranes, with which there is an intimate communication with the Lungs, being provoked in the open Nostril, give an impression of that passion at a distance to the Lungs; most frequently that irregular expiration is stirr'd up, by reason some incongruous or in some measure unproportion'd thing is cast into the Lungs. For in the first place, that this troublesome thing may be removed, the nerves and the nervous fibres dispersed about the Lungs are irritated; afterwards by the consent of these, the muscles of the breast that draw it together, and the moving fibres of the Trachea at once are forced into vehement and often repeated contractions.

The kinds
thereof.

Every Cough is either moist or dry; in the former a certain humour being deposited in some place within the tracheal passages is shaken by coughing, and being to be thrown out upwards is cast into the mouth. That humour, whereas it is manifold and after divers sorts, for the most part it is either call'd ferous, or nutritious, or purulent, or bloody.

A moist Cough.

Of the former there are many kinds and differences; namely, as to its consistence it is either thin, or thick, or crude, or digested; as to its colour, it is either white or yellow, or somewhat greenish; also sometimes it is blewish, or black. Moreover, a moist Cough is variously distinguished, as to the places from whence the humour to be coughed out proceeds. For sometimes cleaving to the sides of the *Larynx*, or sweating from them, the moving fibres being shaken by a gentle little Cough, it is easily and by a short passage cast forth into the mouth; sometimes the matter to be excerned, being impacted a little deeper in the pipes of the *Bronchii*, is not shook out but by large expirations, and often repeated; and lastly, it sometimes happens that the excrements to be cast out, are deposited within the farthest little bladders of the Trachea, out of which it is not brought forth without a vehement labour of coughing, and that frequently repeated, and at last driven forth by a long journey through the whole Lungs. Concerning the Cough of a nutritious humour, as also of a bloody and purulent, hereafter it shall be discoursed when we treat of a Consumption and its remedy.

A dry Cough.

A dry Cough, as often as it is the proper passion of the Lungs, is excited after many manners and by fundry causes; for an obstruction of any of the Pneumonic passages, whether it be by compression, or oppletion, or contraction, doth necessarily induce this. Wherefore an inflammation, a tumour, a little swelling, a stagnation of the blood either through plenty or scarcity, also gravelly, stony, or polypose Concretions, worms and many other preternatural things, inasmuch as they almost perpetually provoke the nervous fibres, do induce a dry, vain Cough, but very troublesome. But a dry Cough sometimes is stirr'd up by the instinct of Nature, as in place of a Pump; to wit, that the blood either by reason of its proper ill temperament, or by reason of the Pneumonic Vessels not being open enough, not passing well through the Lungs, may be promoted by the shaking of these parts, and forced into a more rapid motion.

What belongs unto the other acts of expiration hurt, as when in sneezing, hiccough, laughing, crying, and in other affects its natural and even function is troubled or perverted; seeing the rendrings of the causes of these (which also in another place we have in part designed), do not properly appertain to our purpose, omitting them here we will pass to the thing chiefly designed, viz. to the diseases of the breast and their remedies, and to the reasons of curing them.

SECT. I. CHAP. V.

Of a Phthisis or Consumption in general.

WHereas we have hitherto viewed the fabrick of the Lungs accurately delineated, and the motion thereof together with that of the whole Breast, and the ways and passages of the air, and of the blood, and of other humors through them; and have also observed their various impediments, their remora's, or diversions, according to which it happens the act of the Pneumonic function is after a diverse manner hurt or perverted in inspiration and expiration: now in the next place we are to descend to the Pathology of this region so travelled over, and, which was our design from the beginning, to treat of Medicines belonging to the *Thorax*, or Remedies appropriated to heal the distempers of the Breast, and the manner of their operation.

Of all the diseases of the Breast a Phthisis, or Consumption, by right claims the first place: for there is none more frequent or difficult to cure. Moreover all the other affects of the *Thorax* being ill, or not at all cured, do lead into this, as lesser streams into a greater Lake, and so ending in a Phthisis, lose both their natures and ancient names.

But truly these terms of *Phthisis* and *Tabes* in their proper signification denote an Atrophy, or a withering away of the solid parts with debility of strength: the distempers of which sort frequently proceed from a wound or Ulcer of the Lungs; notwithstanding sometimes without any fault of these, the extenuation or pining away of the whole body takes its rise from the meer fault of the blood, or chiefly from the nervous juice. Therefore before we handle a private pulmonary Phthisis, seems to our purpose to explain the general reasons of this sickness, and to declare how many ways, and from what causes the ill temperaments of the humors are wont to induce a privation of nourishment of the whole body, as it were consumptive. For truly the Consumption of the Lungs it self doth not next and immediately proceed from an Ulcer or corruption of that bowel; but it arises for as much as the blood from them contracting a corruption, and highly defiled, for that very cause loses altogether its nutritive virtue. Moreover as well this as the nervous liquor acquires such an indisposition. Of which in general we will now inquire.

And first what relates to the Blood, we may often take notice, that some pine away without a Cough, or without any apparent fault either in the Lungs or Breast; in the mean time as to appetite, digestion, sleep, and almost the oeconomy of the whole natural and animal function do carry themselves indifferent; notwithstanding, as if nourishment should be poured into a Receptacle bored through, they are not nourished, but pine away sensibly maugre all Dietetical Rules. The formal or conjunct reason of which kind of affect frequently consists only in this, that the blood being notably depraved, cannot assimilate the nourishing juice continually mixt with it; wherefore it doth not only forthwith send it away, but also takes away some particles of the solid parts; which snatching to it self, it presently throws out, or casts it into some place or other, or consumes it by evaporation.

The depravations or degenerate states of the blood, that are wont to induce an Atrophy, either consist in its proper distemper, or themselves are communicated from some other place, and indeed chiefly from the bowels, or from the nervous liquor being also degenerate.

The proper Dyscrasie of the blood it self is twofold, according to which it happens, that the saline-acid particles or the sulphureous and most sharp are exalted above measure, and predominate over the rest. For sometimes the blood withdraws it self from its genuine disposition, viz. a sweet and volatile into an acid, as is always found in scorbutical, melancholy, or cachectical persons. Wherefore the nutritious juice being ever mingled with the bloody mass, seeing it cannot for that reason be assimilated, and affixed to the solid parts, is released again in a short time; and is either forthwith sent away by Urine, Sweat, or a Diarrhoea; or being pent up within the flesh or cavities of the bowels, brings a Dropsie: of which sort of distempers, being led forth into an evil state, the ordinary effect is wont to be, that when some parts do swell very much, other parts are very much extenuated. Here it would be far from our purpose to deliver the true cause of the above-mentioned affects, and to put our sickle not only into another mans harvest, but also one far remote. 2. Moreover there is another state of blood unfit for nourishment quite contrary to this, to wit, when being above measure hot and sulphureous,

A Phthisis accounted chief among the diseases of the breast.

The various acception of Phthisis.

It denotes any Atrophy.

An Atrophy first depends on the blood made unfit to nourish.

The consumptive Dyscrasie of the blood either from it self or communicated from other parts.

1. The kinds of the former are reckoned up.

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*This proceeds
sometimes from
a fault of the
bowels or solid
parts ;*

phureous, and from thence always violently burning out, it consumes the nutritious juice by its effervescence and raging, and causes it too much to evaporate; so that the solid parts being defrauded of their provision pine away. The persons obnoxious to this distemper have large vessels, and much distended with blood, but their flesh withered and hardened by heat. Though persons so affected seldom pine away to death, yet they grow old sooner, and end their life in a shorter space.

2. The blood not only from its proper *indoles*, but also by reason of a Consumption elsew here, and chiefly communicated from the bowels and nervous juice, is often unfit to nourish. And first this frequently happens by fault of the bowels; for these being ill-affected, sometimes do not duly digest the Chyme to be conveyed over to the blood; also oftentimes they pervert and defile it with their extraneous and heterogeneous ferments, insomuch that the functions are frustrated in the faculties of breeding good blood and nourishment. Moreover sometimes by reason of the Vessels bringing the Chyle obstructed within them, though much be eaten, yet little or less than due, is conveyed into the bloody mass. Also in the bowels of concoction sometimes Tumors, Imposthumes, and Ulcers happen; from whose corruption the blood being infected in its passage, contaminates the rest of the mass, and renders it unapt to the work of nourishing. How often do we see from a Schirrus happening in the Spleen, Liver, Pancreas, or Mesentery, or by an Ulcer or cancerous Tumour of some Gut, as also of a Kidney, Womb, or Bladder, or otherwise malignant Sore, a deadly Atrophy to have succeeded without any notable fault of the Breast or Lungs? Yea Tumors, Imposthumes, or cancerous and strumous Ulcers happening in the outward parts, and especially in the Back, do frequently end in a pernicious Consumption. The reason whereof is plain, viz. in as much as in such distempers both great plenty of the nutritious juice brought to the affected part through the Arteries, is either entirely bestowed in the same place, or from thence is poured fourth abroad, insomuch that all the other parts of the whole body are defrauded of their due provision; as also that the virulent or very incongruous matter there engendered and lodged is swallowed up again by the Veins, which defiles the blood by an impure black gore, and from thence renders it altogether unapt to discharge the faculty of nourishing.

*Or from the
nervous juice.*

Neither only from the bowels and solid parts, but also from the nervous juice the stain (by which it becomes unfit to nourish) is frequently communicated to the blood. For when this liquor degenerates from its genuine temper, to wit, sweet and volatil into an acid, presently flowing out of the fibres and nervous parts, flowing back into the blood, it doth precipitate the liquor thereof, and compels it into fluxes, whereby all the nutritive matter is cast forth, and one while poured forth by Urine or Sweat, another while by Vomit or Loosness. The reasons of all these, and how they come to pass we have explicated in a late Treatise.

*The nervous
juice sometimes
of it self is chief-
ly the cause of
an Atrophy.*

But the nervous liquor, sometimes by it self, departing from its good temper, and being vitiated in its temperament, is a cause of want of nourishment, which also happens to be made in a twofold respect, or two manner of ways. For sometimes that Juice being very much vitiated and degenerate, proves as it were vappid and decayed; so that it doth not actuate enough the fibres as well nervous as carnos, and enlighten them with an animal spirit: wherefore as the motive virtue, so also the nutritive fails in the solid parts. From hence either the entire body, or certain members and parts thereof being for some while affected with a Palsie, at length they wither away: as we have at large declared the reason thereof in another place. 2. We have also observed, that many labouring with a slow Feavour (or as called by us a nervous) do presently languish, and in a short time become much emaciated. In either case the same reason ought to be assigned; for, as is shewed in another place, seeing the animal spirits, together with the nervous liquor, their vehicle (which is as it were the masculine seed) do actuate the nutritive humour every where collected by the solid parts even as the feminine seed, and render it as it were pregnant with a nutritive faculty; for that cause if that nervous liquor becomes either depraved or vappid, the bulk of the solid parts pines away as if it were made barren.

*Two chief kinds
of Atrophies.*

Tubes Dorsalis.

Two kinds.

So much of these things touching an Atrophy, or waxing lean, and the formal reasons thereof, the causes and various manners of its coming to pass in general. Of this disease as there are many Kinds and differences, so two chiefly and more observably occur, whereof either will deserve a particular consideration; viz. *Tubes* or *Phthisis Dorsalis* commonly so called, and a Consumption of the Lungs. This latter, which properly belongs to this place, shall be discussed in the following Chapter; in the mean time concerning that (because the knowledge thereof doth illustrate the Pathology of this (we shall speak in a word. *Tubes Dorsalis*, although it hath almost lost its name in this our Age, or perhaps changed it into a Gonorrhœa, yet *Hippocrates* makes mention of it, and handling it avowedly,

avowedly, he assigned a twofold kind thereof, *viz.* one from immoderate Venery, and the other from a destillation into the Spine of the Back. What relates to the latter, I have often observed some to be most grievously vexed with a pain about their Loyns; yea sometimes in the whole Back, which when for some time some have so laboured under, they afterwards come to be lame or crooked, and at last fall away in the whole body, all but the head. The cause of which disease doubtless consists in this; *viz.* first a humour or a certain incongruous morbid matter, descending with the nervous juice through the spinal marrow, did run into the branches of the vertebral Nerves, and therefore from the beginning; by reason of the Fibres being twitched, a continual pain almost did arise; afterwards by reason of some Fibres being resolved, the opposite ones more vehemently contracted distort certain Vertebra's of the Spine; and lastly seeing the animal Spirits cannot actuate enough the Nerves and Fibres belonging to the trunk and members, by reason of the nourishment frustrated, the withering of the entire body succeeds. Surely when the nervous liquor and animal spirits pass not fully and freely out of the Dorsal Spine into the whole body, from thence oftentimes a pining doth arise: hence Imposthumes and Ulcers arise about the Loins or the *Os sacrum*, which in as much as they consume or pour fourth the nervous liquor too much, cause an Atrophy in the whole, at least in the lower parts.

2. Another kind of *Tabes Dorsalis* far more frequent, is also twofold: *viz.* it either ariseth from the great or too-often loss of the genital humor, or from a continual corrupt flux from the genital parts.

1. As to the first, it is manifest by vulgar observation, that the immoderate use of Venery, yea involuntary efflux of the seed, if it be either great or continual, produce a faintness in the whole body, and at length a pining away. The reason of this (as we have intimated in another place) is not, that the seed, according to the opinion of some, descends from the Brain through the Nerves into the spermatic bodies, and from thence, by reason of a great loss thereof first the Brain, and then the parts, all depending on the influence of the Spirits springing from thence, become infirm and pine away. But seeing we have sufficiently evinced, that the seminal matter is immediately supplied out of the mass of blood into the genital parts, and that it is altogether the same with that out of which the animal Spirits instilled into the Brain are procreated, it will necessarily follow by how much the greater portion is got to the Testicles for repairing the loss of seed, by so much is the Brain defrauded of its due share, and therefore at length the function in the whole body, as well motive as nutritive, doth waver and diminish. Our furious Whoremongers are sensible of a great debility about their Loins, and the parts placed below them, to wit, the Thighs and Legs do chiefly wither away; the reason is, because as well the provision of the animal Spirits in its first spring, *viz.* in the Brain failing, the outmost channels, *viz.* the ends of the spinal marrow, and the Nerves springing from it, do suffer first and chiefly for this defect; and moreover because near the Loins the Arterious blood gives out to the Testicles more excellent particles and chiefly restorative, being destined to nourish the Back, and in the mean time the venous blood being for that cause decayed or consumed, is enfeebled, and steals from the Loins as much as possibly may be.

The loss of the seed causing a Consumption is sometimes voluntary, of which sort the salacious and prone to Venery do suffer: sometimes involuntary; of which affects there are divers kinds. For in some it only happens by dreams or obscene phantasms; but in others, besides those occasions, every endeavour of the Back, whether through bearing a weight, or excretion of Urine, or the *faces* of the Belly, causes the genital humor to be thrust out: the cause whereof is, both because the seed is watry and thin, and at once sharp and provocative, also because the parts are weak, and not able duly to digest or retain it.

In the other *Tabes Dorsalis* above-mentioned, not the seed it self, but an ichor or a certain putrilage is cast out abundantly from the genital parts; the efflux whereof, if it be great and continual, doth frequently impair the strength of the whole body, and by withdrawing and prodigally removing the nutritive matter, it induces an Atrophy or Consumption. For near the spermatic Vessels, or in passage from them, as well in men as women, there are certain Emunctories placed, whose faculty is to receive the superfluous humour from the seed formed, and when it abounds to send it abroad through the genital parts. For this cause that those passages in either Sex may be made slippery and moist (lest they grow dry, and become less sensible) the Prostates in men and the Glandules about the horns of the Womb in women are constituted: out of both which always in the act of coition, and sometimes without, when the spermatic bodies abound with too much moisture, a certain serous liquor sweats out: and in women (whose bodies are more moist, and in whom Nature hath made these ways for their

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From the nervous juice stopt or depraved in the loyns.

From the expense of the humour through the genital parts.

That humour is first either seed, a too great expense whereof induces an Atrophy.

The losses whereof are voluntary or involuntary.

2. Or Ichor flowing into those parts from solution of continuity.

The formal reason of a virulent Gonorrhoea.

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menstrual excretion) this doth oftner and more plentifully happen than to men. But if these Emunctories be affected with a great debility, or a certain virulency, so that they corrupt this liquor sent, or do not retain it enough, it is not only sent away incessantly, and flows out plentifully through the *Pudendum*, but also other superfluous humours or recrements of the whole body flowing together to those weak parts are thrown forth together. Also the nutritious Juice destined to the neighbouring parts flows thither, and presently goes out together; so that at length by reason of the loss of the nutritious Juice (which flowing to the same place is corrupted and continually sent away) not only pains of the neighbouring parts, but of the whole body, and a pining doth succeed. These things are commonly known in a *Gonorrhœa*, also in *fluore muliebri*, or those affects from an impure bed, or immoderate Venery, or are caused by a blow, a bruise, violent exercise, or any other hurt inflicted upon the Loins. It is not proper to this place to deliver particularly the true rendering of the cause and curatory method of healing of this sort of passions: we shall proceed to treat of a *Phthisis* or *Tubes* properly so called, viz. which arises from the only or chief fault of the Lungs, which was the business of our design.

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Of a Phthisis properly so called, or of a Consumption arising by fault of the Lungs.

A Consumption doth so frequently and usually proceed from the Lungs being depraved, that some have termed it the peculiar Disease of this Bowel: and that it very often so comes to pass, the reason is; because (as we have shewed before) the pining of the body doth for the most part more immediately proceed from the blood depraved and unapt for nourishment, it is manifest, that as its perfection is acquired in the Lungs, so from these being ill-affected the same is most of all vitiated, and degenerates into a languishing and corruptible state. For in the Lungs rather than in the Heart or Brain, the threads of life are spun, and there they are oftneft defiled or broken.

The definition
of a Phthisis.

A Phthisis is usually defined to be A pining away of the whole body, taking its rise from an Ulcer in the Lungs. But less true: because I have opened the dead bodies of many that have died of this disease, in whom the Lungs were free from any Ulcer, yet they were set about with little swellings, or stones, or sandy matter throughout the whole: for from thence the blood, because it could neither be freely circulated in the *Præcordium*, nor animated enough by the nitrous air, and when in the mean time it is perpetually polluted by its proper dregs deposited in the Lungs, is frequently vitiated and made incapable of nourishing thereby: wherefore a *Phthisis* is better defined, That it is a withering away of the whole body arising from an ill formation of the Lungs.

The cause assigned
by the Ancients.

The Ancients following *Hippocrates*, for the most part have assigned only two causes of this disease, viz. a *Catarrh*, and the breaking of a Vein, to which some have added an *Empyema*: and others exclude a *Catarrh* from this number: for what is vulgarly affirmed, that slegm falling from the Head into the Lungs, and abiding there putrifies, is most commonly the cause of a *Phthisis*, or is often brought by it, we have formerly intimated to be altogether erroneous, and shall presently shew it more clearly. In the mean time to shew what the matter is that generates a Consumption as often as it arises without an *Empyema* or *Hæmoptoe* going before, it must be considered after how many manners and by what ways any thing disagreeable or Heterogene can enter into the Lungs; which diligent search being made, it will easily appear, that any thing that is an enemy to the Lungs creeps in and is admitted chiefly either by the *Trachea* or by the *Pneumonic Arteries*, yea and sometimes haply by the *Nerves*, but nothing by the *Veins* or *Lympheducts*, whose function is only to carry back or away the blood or *Lympha*, and to leave there nothing at all.

What the consumptive matter
is.

By what ways
it enters the
Lungs.

Sometimes by
the *Trachea*, yet
not destilling
from the head.

As to the *Trachea*, it is manifest it is ordained for this end, that by its passages or pipes the air might be conveyed in or presently carried back by a constant recourse from whence it comes; moreover, whether any matter being hurtful or mortal to the *Præcordia* may be admitted the same way, shall be now our present disquisition. And that the Lungs frequently incur a pernicious pollution by this entrance is clear from hence

hence because the moist air, of some regions, repleat with fumes, or abounding with malignant vapours, doth frequently induce the consumptive inclination; nevertheless the affection thereof is wont to be communicated only by aerial minute particles (whereby either the temperament of the blood or the conformation of the Lungs or both are prejudiced.) But whether besides this a serous matter or some humor corrupting the Lungs doth enter them through this passage, is not without reason doubted: though many do determine a Catarrh or a distillation of the Serum from the Brain into the Lungs by the passages of the *Trachea*, the principal cause of a Phthisis. Which opinion being erroneously delivered by the Ancients, I admire any either of our modern Physicians or Philosophers have admitted thereof; for it is manifest by anatomical observations, that nothing from the Brain by the *Glandula pituitaria* (which seems the only passage from thence) falls down into the Palate or Breast, but that the Serum there deposited is conveyed by appropriate passages to the jugular Veins, and is remanded to the blood. Moreover it is manifest to sight, that whatsoever relique of Serum is laid aside in the Glandules of the Ears, Mouth, Nose, or Face, is conveyed from them all by peculiar passages, insomuch that no humor whatsoever destils from the Brain or the Palate into the Lungs.

But although matter exciting a Cough doth not destil from the Head by the *Trachea* into the Lungs, yet sometimes falling down from the sides of the *Trachea* into their Cavities, it produces that Disease commonly called a Catarrh. For the *Aspera Arteria*, like the Arteries bringing blood, are endued with a nervous and musculous Coat, and so do occasionally enjoy sense and motion, having also a glandulous Coat and full of little vessels to sustain the vital heat and nourishment. These last Coats make those interspaces, and as it were cover the Cartilages. Moreover the superfluous serosities proceeding from the blood watering the *Trachea* are deposited into this glandulous Coat, which for the most part presently sweating into the Cavities of the *Trachea*, serves chiefly to make them slippery and moist. But if the mass of blood be poured out too much, and precipitated into serosities (as it frequently happens, a cold being taken, or the swallowing down of acid things, and on many other occasions) for this cause a great plenty of watry matter sweats out of the Glandules of the *Trachea* and mouths of the little Arteries into its Cavities, which soon doth cause a most troublesom Cough, and often much spittle (which afterwards comes to be consumptive.)

But sweating
out of the sides
of the *Trachea*.

But surely this cause of Spittle and as it were a Catarrhal Cough very rarely comes alone, because while the blood watering the *Trachea* having suffered solution, throws in its serosities into the Glandules (whence presently they sweat into its Cavities) and also the remaining blood being in like sort dissolved, it insinuates its Serum set apart within the Pneumonic Arteries, partly into the Tracheal hollownesses, and partly into the Lympheducts, by the overflowing whereof the Lungs are as it were overwhelmed and much incited, for the most part provok'd to Cough and continual spitting. A Cough and spitting of this kind as long as moderate, only throwing off the serosities of the blood, rather are beneficial than prejudicial; because the mass of blood, and the very Lungs being thoroughly purged after this sort, those symptoms for the most part spontaneously abate, and from thence ensues a more perfect health. But if they be protracted a long time, the serous humour being on both sides laid aside into the tracheal passages, and from thence more plentifully daily heapt up, at length it will change into corruption; because as well the free enjoyment of air is impeded, as also the motion of the blood, and its temperature wholly perverted; from hence a Cough becomes more fierce, and breathing more difficult; nay rather the whole mass of blood in as much as it is defiled by the foul blood (which the Veins receive from the Lungs) degenerating by degrees from its benign properties, and being depraved, it not only continually pours forth the superfluous Serum, but also the nutritive Juice (which it cannot assimilate) out of the Pneumonic Arteries into the tracheal passages; and so this mass of consumptive matter is daily increased, till the Lungs being more and more obstructed and filled, and the blood being defiled, and rendred unfit to perform any of its functions, the Cough and Spittle become worse and worse, and presently become dangerous; Moreover breathing being hurt, the faintness and pining away of the whole body, the debility of all the functions, and at length a hectic fever, and a hasty declination to death follows.

The consumptive
matter brought
into the Lungs
rather by the
pneumonic Arteries.

A Cough and
spitting some-
times healthful.

Yet often being
too much is dan-
gerous.

When by the long continuance of a Cough and Spitting, lessurely encreasing, the humour is more plentifully deposited out of the mass of blood into the Lungs, it first of all enters into the tracheal little bladders, and at length fills them, and somewhat distends them, from which while every morning by expectoration thence more copiously performed, it is almost entirely cast out from them, thence the *Thorax* is exempt for a short space from the burden, and respiration seems more free, yet a little afterwards

Why the Con-
sumptive matter
affects, and by
degrees hurts
the lungs.

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afterwards the blood being stuff'd again with *Serum* or nutritive juice, it pours down new matter into the Lungs; and from thence again after meat or sleep the little bladders are fill'd, and the humors by the afflux daily encreased, are more distended and enlarged, and at length the sides of two or more of the little bladders, being burst, many little bladders are here and there framed as it were into one lake, within which the consumptive matter being more abundantly collected, there it putrifies (for it is not entirely presently cast out) and from thence it corrupts the substance of the Lungs, to which it is joined, and imparts a putrid defilement to the blood passing through it. This breach thus made in the Lungs is daily encreased, and frequently more are at the same time formed in divers places, and by reason of the great plenty of humours heaped up and putrified in them, a heaviness of the breast is felt, like a weighty burden upon them, the breathing is more hindred; moreover from the tabid blood being more plentifully intermix'd with the mass of blood, frequent effervescencies of it, destruction of the nutritive juice, also thirst, heat, loss of appetite, nightly sweats, and a pining of the whole body do arise. But the blood being polluted from the Lungs, causes them to be punished with a reciprocal affection, that is to say from its peculiar pollution; because the blood in the veins receiving this purulent matter in every circuit, it immediately delivers it into the arterial; from whence, whereas it cannot be sent enough away by sweat, or by Urine, it is brought back by the Pneumonic arteries to the Lungs, where again being separated from the blood, it is every where conveyed as well into the little bladders of the Trachea as into the lesser passages; insomuch, that at length the whole frame of the Lungs being filled, clefts or ulcers are formed consequently in many places, and all the other hollownesses are stufft with frothy matter.

How an Ulcer of the Lungs is made.

An ulcer of the lungs covered with a callous less prejudicial.

But sometimes it happens that there is one Ulcer or hole, or happily two formed in the Lungs, and the sides grow callous round about, so that the matter being there gathered together is not conveyed into the mass of blood, but is daily expectorated though in a vast plenty. They that are so affected, as if they had but an issue in the Lungs, although they cast up much Spittle, and thick and yellow matter every morning, and a little sometimes all day, yet otherwise they live well enough in health, they breath, eat and sleep well, are well in flesh, or at least remain in an indifferent habit of body, and frequently arrive to old age: insomuch that some are said to have been consumptive thirty or forty years, and to have prolonged the disease even unto the term of their life (for that cause not being shortened.) And in the mean time others who cough or spit less, within a few months fall into a hectic fever, and in a short while are hurried into their grave.

The evident causes of a consumption.

Hitherto touching the conjunct cause and formal reason of a Phthisis or pulmonary Consumption; what belongs to the other causes (that is to say, procaccatic and evident ones) they truly are various and manifold, inasmuch namely as they are more near or more remote, inward or outward, and lastly connatural or adventitious; That I may undertake to design the powers, operations, and modes of effecting of all these in producing a Phthisis; primarily it is requisite that I shew, by how many modes, and by reason of what occasions the serous humour or (as folks commonly say) the Catarrhal, is laid apart out of the mass of blood into the little Bladders of the Lungs, and into other Passages of the Trachea. Upon diligent search of this it is obvious to any one to perceive the morbid cause consists of two parts, and that the fault is in the ill temper of the blood sending an offending matter to the *Thorax*, and also the weakness for ill tone of the Lungs easily receiving it.

The primary causes of a Consumption some from the blood, others in part from the lungs.

The ill temper of the blood disposes to it.

As to the former, it is manifest enough by common observation, that the mass of blood being stufft with incongruous particles, viz. its proper ones degenerated, or with others from other places intermingled, doth boyl up for the expurging of them, and what is to be separated, when it is not easily sent away by any other ways, it is spread abroad into the Lungs, (if they are of a weaker constitution) and cleaves to them.

There are many dyscrasies of the blood, and those of divers kinds and affections, by which its liquor being dissolv'd in its consistence, and as it were curdled, doth not rightly contain the serous and nutritive juice within it self; moreover sending away these and other excrementitious humours uncessantly from it self, as sometimes it deposits them among other parts, so more often into the Lungs.

1. The blood sometimes like Milk grown sour of it self, is depraved by little and little, and at length departing from its genuine faculty into a sourness, and being dissolv'd in its existence, doth cast abroad its serosities (too easily prone to separate themselves) out of the Pneumonic and also Tracheal Arteries into the Tracheal passages. Thus to some it is ordinary once or twice in a year, without any manifest cause to be afflicted with a grievous and troublesome Cough, with copious spitting, which

which in a certain process of time (after the blood purged from its dregs and excrements recovers its temperature) doth spontaneously abate, and after doth succeed a more firm and durable health. By reason of such a Cough serving for a purge to the blood, I have known some often in a day, and especially every morning, who were wont to spit out spittle like black Ink, with a small endeavour of the Trachea; which distemper when for many months they had constantly labour'd under, after a greater Cough occasionally contracted, with much and yellow spittle, they have afterwards escaped altogether free from that former black spittle; the reason whereof is, that a heavier Cough abiding with plentiful spitting for several days, altogether purges away those melancholy feculencies from the blood, and moreover it alters the temperament of the blood, or rather takes away the ill temperament thereof.

2. The nervous juice being frequently degenerated, and with an abundant lymph returning back out of the fibres and nervous parts into the blood, as it produces ill affects of the bowels, and of the reins (whereof in another place we have hinted) so sometimes it causes a fierce and very troublesome Cough. This kind of Cough one while is Catarrhal, inasmuch as the Lympha having pass'd through the mass of blood, is deposited in the Lungs by the Arteries; another while it is convulsive, inasmuch as the Nerves and Fibres, constituted to move the breast, are possess'd by that liquor, and are provok'd into convulsive motions: from either cause either conjunct or separately it comes to pass, that more grievous passions of the brain and nervous kind frequently call on a troublesome Cough, or are wholly changed into it.

3. Besides the faults of the blood and nervous juice; frequently exciting a Cough, it is probable that it sometimes arises from the Lympheducts being obstructed, which belong unto the Lungs: for whereas very many Vessels of this kind are spread abroad through the Lungs, whose function it is to receive whatsoever is superfluous of the Lympha that is carried through the Arteries into the *Præcordia*, and not immediately brought back by the veins, and to convey it to the trunk of the passage of the *Thorax*; if by chance it happens that these passages are stop'd, or obstructed by viscid matter, or compress'd or thickned by cold should not well discharge their duty, it must needs be that those watery excrements shut out from their wonted flues, or whirling back into the blood, do incite its fierce boiling up, or being poured into the passages of the Trachea, do stir up a Cough.

4. Neither do the humors above-mentioned only, in as much as they either pervert or hinder the crasis or motion of the blood, induce a Cough (which frequently is the beginning of a Phthisis;) but moreover any usual or wonted Evacuations supressed, or let, do usually impress a fault upon the Lungs. The menstuous flux or the Hæmorrhoids obstructed, often bleeding at the Nose if by chance it ceases, Issues closed up, Pustles, Scabs and Wheals driven back, do frequently affix a taint in the *Thorax*. If a plentiful spitting from the Glandules of the Mouth stops of its own accord, or be cured by Medicine, afterwards sometimes a Consumptive Cough succeeds; wherefore the same is vulgarly called a Rheum, which had lately fallen from the Head into the jaws and Throat, and thence distilled deeper into the Lungs; when indeed it is nothing else but a certain superfluous serosity of blood, that being used to be put aside by the cephalic Arteries into the Glandules of the Mouth, now being excluded thence, is hurried through the Pneumonic Arteries into the Lungs.

Besides these private and periodical, or extraordinary evacuations, whose suppressions incline to a Cough and Phthisis, there occurs another general and constant Evacuation viz. insensible transpiration; which being either stop'd or suppressed, is oftner the occasion or parent of that evil than all the rest. For the steams that usually evaporate by the Pores of the skin being restrained within, ferment the blood, and soon pervert it, and cause it to be precipitated into serosities; which with other excrements of the mass of Blood being immediately laid aside in the Lungs, do stir up a troublesome Cough and often a Consumptive one. Hence it is a common observation, that the catching of a cold, by which the Pores are stop'd, whether it be by blowing of cold air, or being wet by rain, or leaving off cloaths, or by what other means it may come to pass, disposes very many to distempers of the *Thorax*. Wherefore in our Idiom the cause being put for the effect, a Cough is called *Catching of cold*.

These are the chief causes and occasions which occur from the blood any ways depraved, and therefore depositing a peccant matter into the Lungs. There follow other causes in regard of the Lung it self, viz. those which dispose this Bowel more readily to a Cough or a Phthisis, of which there are three sorts. 1. An ill frame of the Breast. 2. And innate weakness of the Lungs, or hereditary disposition to a Consumption. 3. Preceding diseases of the *Thorax*, as a Wound, a Blow, a Pleurisie Peripneumony, Empyema, spitting of Blood, the small Pox and Measles, &c. 4. The incongruity

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And sometimes it receives a consumptive taint from the nervous juice.

And sometimes by reason of a fault communicated from the Lympheducts.

The fourth reason is usual evacuations suppressed.

By reason of transpiration hindered.

Partly from the Lungs. From the breast ill formed. From the hereditary disposition. From foregoing distempers of the breast.

From incongruity of the air.

of air which is inspired (as deserving a place among the procatastic causes.) By reason of any one of these causes, and sometimes of many together, the matter provoking a Cough, proving often after Consumptive, doth easily assault the Lungs, and enters them, and frequently imprints a deadly hurt. On each of these we shall insist a little.

The reason of the former exposed.

First therefore as to the frame of the Breast the case stands thus; viz. that the Lungs being still whole and sound, and free from any Phthisical impression, may be kept for a long time in their office, it will behove that they still be exercised with a motion that is vigorous, and with stretched out sails as it were to discharge the strong interchanges of the Systole and Diastole; to that end, that the air being plentifully sucked in, may be admitted to their inmost apartments, and from thence immediately be cast back for the most part together with all the effluvia and sooty vapors at every change of breath. Wherefore since the action of the Lungs doth depend much on the frame of the Thorax, as being the moving Engine, it must needs be, that by reason of its ill fashioning, the function of breathing becomes defective in many things. There are two special kinds of a Breast ill framed, (viz. crookedness, and shoulders like wings) for which reason many are found prone to a Phthisis: the reason of which is, that in any such figure of the breast, being either depressed or made long, the Lungs do neither enjoy a space so free and ample, nor can the moving Muscles be so strongly contracted as in a square breast.

What an hereditary disposition is.

2. The innate debility or hereditary disposition of the Lungs to a Consumption is so frequent and vulgarly known, that when any is found inclining to a Consumption, he is presently questioned, whether his parents were not obnoxious to this Distemper? Very many of these being endued with a narrow breast and a neck somewhat long, and of a constitution very tender, contract a Cough from the least occasion; neither can they endure a cold or moist air. To some of these a Mansion in a City is very prejudicial, where the air is breathed in thick and smoaky; on the contrary, to others prone unto the same disposition it is very friendly (the reason whereof we shall diligently inquire hereafter.) To all of them a North-wind is for the most part an enemy, considering that it usually irritates a Cough, also Spitting of blood, a Pleurisy, or Peripneumony, viz. The Pneumonic or the Thoracical Vessels being thereby stuffed, and in the mean time the blood being rendered more turgid and sharp, by reason of transpiration hindered, and effluvia's restrained within the mass thereof.

In what it consists.

For an Hereditary disposition to a Phthisis doth chiefly consist in these two things, viz. 1. In regard the Patients being endued with a more sharp and elastick blood, do require a more plentiful transpiration; which perhaps if it be less granted, the matter that was wont to evaporate redounds upon the infirm Lungs. 2. If the Pneumonic Vessels be too loose and tender, they do not duly contain the Serum and other recrements of blood within the dissolved mass thereof, but they sometimes suffer both them and a certain portion of the blood it self to break out into the Tracheal passages: whose moving Fibres, when they are infirm, do not presently turn forth what is poured out into the cavities; but they suffer it to abide and putrify in the same place, and at length to degenerate into black filthy gore corruptive both of the Lungs and blood.

What the consumptive diseases of the breast are.

3. A Phthisis is sometimes the product or consequent of some other previous distempers of the Breast. Those consumptive passions chiefly are Empyema's, Pleurisies, a Peripneumony and Impostume of the Lungs; and sometimes the small Pox, Measles: also irregular Feavers ill or slightly judged, do cause the same effect. The chief of these distempers, or at least those which are proper to the Thorax, together with the rendering the reason of the causes, and how they dispose to a Consumption, shall be declared hereafter, with the reasons and manner of procedure; in the mean time we are to take notice, that this kind of fault is common to them all, that is to say, they dissolve the unity and weaken the tone of the Lungs, and pervert the temperature of the blood; whence whatsoever incongruous or distempered thing is poured out upon them from its depraved mass, they do easily admit thereof, and difficultly or not at all drive it back.

The influence of the air for exciting a Consumption.

4. The procatastic causes of a Phthisis being now explained, viz. those which consist as well from the blood as the Lungs, there is another common to them both, which may be justly added, and (although altogether extrinsic) hath great affinity with them both, viz. the condition or temper of the air breathed in. For such is the influence hereof to some Consumptive Persons, that the cause of the disease is sometimes wholly ascribed to the incongruity of the air wherein they dwell, and for a cure the alteration of air or soil is preferred to all other remedies whatsoever. Hence many of our Country troubled with a Cough, or being in a Consumption, flock to the Southern parts of France; and others in the mean time who cannot go beyond Sea, or will not, presently hasten to remove out of the City-smoke into the Country as to a most undoubted refuge

fuge : wherefore all our Villages near *London*, which enjoy a clear and open air, are esteemed as so many Spittles for Consumptive Persons. Notwithstanding all do not alike receive help from such a change of places ; for many either passing to *France* or to Country Villages, do in those places rather find their graves than Health. And therefore *London* is not presently to be forsaken by all phthical Persons : for I have known many obnoxious to a Cough or Consumption to have enjoyed their health much better in this smoaky air than in the Country. So that for Cure of the same Disease, while some avoid this City as Hell, others flye to it as to an *Asylum*.

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The reasons of these things do clearly appear out of the Doctrine of Breathing before handled ; for we do demonstrate the blood passing through the Lungs, both as to its kindling or vitality, and as to its motion doth chiefly depend on nitrous air sucked in ; whence it is a consequence, that the tenor of this ought to be so proportioned to the temperament of that, that the blood being moderately kindled within the *Præcordia*, may burn out clearly and vigorously, as well without smoak and sootiness as without too intense a flame, and that it may pass the Pneumonick Vessels freely, and without any hindrance of leaving off recrements. Wherefore a moist, fenny, and close air, as it is healthful to none, so to them that Cough it is especially hurtful ; on the contrary, a serene and mild air, moderately enjoying the Sun and wind, as it is healthful to all persons, so it is friendly to all Consumptive Persons. As to other conditions of the air, some escape a Cough, or loose it living in mountainous places exposed to the Sun, where the impendent Atmosphere being free from all thick, smoaky, and feculent vapours whatsoever, abounds with nitrous particles : for those whose thick and feculent blood abounds with an impure Sulphur, to kindle this duly and to waste the dregginess, there is need of a very thin and nitrous air. If the Lungs be not too tender, but firm and strong, they endure the more fierce assaults of its Particles ; on the other side, they who have a thin and subtile blood, easily dissolvable and endued with a more pure but very little Sulphur, and having tender and soft Lungs, very sensible, and of a fine texture ; these persons being impatient of a nitrous and sharper air, are most at ease and best in a thick and more sulphureous one. Wherefore it conduces to these persons, that they breath the gross and more fat air of a smoaky City ; which to an impoverished and more thin blood, doth afford Sulphur (which fails sometimes) and also Nitre, and doth something thicken and fix its subtile consistence ; moreover it dulls the substance or texture of a Lung too much sensible and more thin, and is a defence against the invasions of a more sharp and improporionate Air. It is manifest by frequent experience, that a thicker Air, provided it be sulphureous, proves very benign to some Phthical persons (that I do not say to all.) It is a common observation, that a Consumption seldom infests those Regions either in *England* or *Holland*, where fires are nourished by turf, and do breath a very sulphureous odour, yea rather those places are chiefly wholesom and frequently sanative to Persons obnoxious to a Phthisis or labouring under it. To which we may add, that a suffumigation of Sulphur and Arsenic (which is filled with much Sulphur) is reputed for the curing of almost incurable Ulcers of the Lungs, although the last, yet the most efficacious remedy. Moreover add to this, that pectoral Medicines prepared of Sulphur are far to be preferred to any other ; so that Sulphur is justly reported by Chymists to be the Balsam of the Lungs. By what order, and by what means these Medicines do work, and so notably help in Diseases of the *Thorax*, we shall hereafter make diligent search into : in the mean time that Sulphureous Air is found helpful to several Phthical Persons, the reason consists in these two things ; viz. in the first place, as we now intimated, from such an Air sucked in there is help brought to the jejune and depauperated blood and to the tender Lungs. Secondly, that the sulphureous Particles being sucked in with the nitrous, do provide against, or take away the acidities of any of the humors (by which their flowings and extravasations into the Lungs do chiefly arise.) And for this reason it is that sulphureous Medicines, being also taken inwardly, do confer so excellent a help to them that cough or are phthical : and therefore Sulphur, as I now hinted, hath the report of being the Balsam of the Lungs. For as Balsamic things applied to an Ulcer or Wound extinguish the acidity of the Ichôr there sweating out and corrupting and paining the little Fibres, soon ease the pain, and afterwards heal the wound ; so also the sulphureous Particles, passed into the Lungs either with the air or with the blood, in as much as they provide against or abolish the acidities of all humors, i.e. the blood, the Serum, the Lympha, the nervous or nutritive Juice, they conduce to the prevention or cure of a Consumption. We shall in what follows more at large declare the cause, when sulphureous Medicines shall be particularly treated of.

The conjunct and procatactic causes of a Phthisis being thus handled, it will not be necessary to discourse much touching the evident causes. For in what manner a closing

The grosser and City--air to some Consumptive persons healthful to others hurtful.

The reason whereof is inquired.

A sulphureous air healthful to some Consumptives.

Sulphureous Medicines chiefly agreeing.

The reason thereof is discoursed.

*The three times
or distinct states
of a Cough.*

of the Pores by cold, a surfeit or tipling, and other errors of several sorts, in the six non-naturals, dispose to those distempers, and sometimes presently do bring them, is so clear, that it needs no explaining. Neither is there any reason we should be long delayed about the Semiotical part of this Disease; nevertheless it is fit we observe the divers states or distinctive signs which certainly belong unto it. 1. When it is merely a Cough. 2. When it begins to degenerate into a Phthisis. 3. When it is a perfect and almost desperate Phthisis. From which things duly designed, the Prognostic of the above-mentioned affections will be very apparent.

*When new, there
is no suspicion of
a Consumption.*

1. And in the first place what belongs to a new Cough, and as yet alone, this taking its rise from any cause whatsoever in bodies predisposed to a Phthisis, will scarce ever be free from the suspicion of danger; but in a strong man, and one who hath often before endured a Cough Scot-free, it will not be immediately to be feared: for when being stirred up from a more forcible evident cause, without Fever or indisposition of the whole body, it shall not be very troublesome, then it merely passes for a cold being taken, and is altogether neglected, or in a short time is wont to be finished without many or very considerable Remedies. Moreover if a small Fever with thirst and want of appetite accompany this, there is hope that the blood being restored to its due temperament, the Cough then will cease of its own accord: but if it be protracted longer, and not easily yield to vulgar Remedies, and produces much spitting, and that discoloured, it must not be any longer neglected, but be provided against by a method of healing, and by fit remedies and an exact course of diet. For then it may well be suspected, that the Lungs being prejudiced in their structure, do not circulate the blood entirely, but let fall the Serum and Lympha, and frequently the nutritive Juice; and moreover those humors so laid aside do putrify; and from thence the blood is defiled, which by a reciprocal hurt prejudices again the Lungs.

*When it begins
to induce a Con-
sumption.*

2. But if to a Cough growing daily worse and worse with plentiful and thick spittle, a languishing and pining of the whole body, loss of appetite, difficult breathing, thirst, and fervent heat of the blood be added, there is great cause of suspicion that it is come at least to the first limits of a Phthisis (if not further.) Wherefore it will behove us to use all means, whereby the Lungs may be freed from the great quantity of matter heaped up together, and be defended from its continual assault or invasion; and also that the mass of blood being cleansed from all dregs, and restored to its due temperament whereby it may rightly contain its serosities and other humors within it self, or transfer them to some other place than the Lungs.

*When it becomes
a confirmed Con-
sumption.*

3 But if, beyond the state of this distemper now described, plenty of spittle, and that discoloured, shall be daily increased, and all other things growing worse and worse, a dejection of the whole strength, and a Hectic Fever with a continual thirst, night Sweats, an Hippocratical face, an utter decay of the flesh almost to the driness of a Skeleton, happen upon all these, then for the most part no place is left for Medicine, but only a dreadful prognostic; at least all hope of Cure being waved, we must insist upon Anodynes, whereby an easie death may be procured.

*The curing me-
thod, and first
against a begin-
ning Cough.*

What therefore belongs to the Cure of a Cough in general, according to the three above-mentioned states of this Disease, a threefold method of healing ought to be appointed, viz. that bounds as it were being set, we may more distinctly prescribe what is to be done for the cure of a Cough, whilst being on this side of the limits a Phthisis, it passes only for a cold caught. 2. What manner of healing to a beginning Phthisis. 3. What to a Phthisis consummated, or desperate.

*Three indica-
tions.*

1. Although against a new Cough for the most part there are used only Remedies Empirical, and scarce any of the common People but are furnished with many and divers of this sort, whichevery where without the advice of a Physician very many confidently take, and without method, and give them to others: yet men of a delicate constitution, or inclining to a Consumption Hereditarily, or sometimes formerly in hazard from a Cough, ought immediately to provide against the first assaults thereof, and readily betake themselves to the Precepts of Physick; according to which, that the method of healing may be duly instituted, the curatory indications shall be chiefly these three viz. 1. to appease or take off the disorder of the blood, from whence the fluxes of the Serum do proceed. 2. To derive the excrements of the blood and all exuvia, apt to separate from it, from the Lungs to the Pores of the skin, or to the urinary passages, and into the other Emunctories. 3. To strengthen the Lungs themselves against the reception of the Serum and other humors, and also to defend them against the invasion of outward cold, whereby they are wont to receive further hurt. Upon each of these we shall treat a little more plainly.

*The first respects
the effervescence
of the blood.*

1. The first indication respects as well the boiling up of the blood, wherein by rea-
son

son of the effluvia's restrained, it grows too fervently hot, and boils in the vessels; as its dissolution, whereby being solved in its consistence, it lets go too much Serum and other humors from its embraces. For the taking away of both, a thin diet must be appointed, and, the injury from outward cold carefully declined, a little more sweating ought to be procured, or at least the accustomed restored. To this end let the Patient put on thick garments, and let him keep his Bed or Chamber, at least let him hardly go out of this house, evening and morning let a small breathing Sweat be provoked by Posset-drink boiled with Rosemary or Sage. If notwithstanding all this the Cough increases, Phlebotomy, if the strength and constitution will bear it, is often used with success: after which Hypnoticks for the most part help, in as much as they retard the motion of the heart, and consequently the too precipitate course of blood: moreover they cause it to circulate in the Pneumonic Vessels gently and mildly without any great throwing out its ferocities, and to send away what is superfluous either by Sweat or Urine. To this purpose pectoral Decoctions are also to be administered, in as much as they destroy the acidity of humors, and hinder the dissolution of the blood, and its melting into ferocities. By the like reason and manner, Medicines prepared of Sulphur do so signally help against a Cough.

The second indication, viz. that the Serum and other recrements of the blood, derived from the Lungs, may be evacuated by other ways, is performed by Diaphoretics, Diuretics, and mild Purgers; which ought to be mixed with other Remedies, or now and then used alone. Wherefore after Phlebotomy we use to prescribe a gentle Purge, and sometimes to repeat it. Among the Ingredients of the Pectoral Decoction let the Root of Chervile, Butchers-broom, Elicampagne, and other things that provoke Sweat and Urine be put. Hog-lice, volatile Salt of Amber, and other fixed Salts and Powders of Shells made into Pills with Turpentine are often given with success.

The second respects the derivation of the Serum and other excrements from the Lungs.

The third indication, that the Lungs and their passages might be defended against the flowing of humors, the encountering of cold, and the suppression of the Catarrh, as they commonly call it, is performed by Linctus's, Lohochs, and other private Remedies, and chiefly respects two things; viz. that the mouths of the Vessels and Glandules opening into the Trachea be shut with moderate Astringents, lest they should too much cast out the ferocities into it: and secondly, that the sides of the Tracheal passages may be made smooth and glib, that neither from the pouring out of the sharp Serum, nor invasion of any outward cold they may be offended, and continually provoked into a troublesome Cough; and moreover when those passages are made slippery enough, the spittle sometimes obstinately cleaving to their sides, might be the more easily coughed out. For the first intention it is, that Conserve of red Roses, Olibanum, Mastich, Lohoch of Pine-tree, Syrup of Jujubes, of dried Roses, of Cup-moss, and other Astringents are often put into the forms of Pectoral Prescriptions. For the second intention Liquorish, with the divers preparations thereof, is reputed a famous Remedy against any Cough: for this purpose Syrups and Lohochs, and all other sweet Pectorals seem to be ordained. To which is added Oyl of sweet Almonds, either administered by it self, or brought with Pectoral Syrups after a long stirring of them together into a milk-form liquor.

The third intends the suppressing the Catarrh and strengthening the Lungs.

Forms of Medicines which are most in use.

These are the chief Therapeutic indications, together with the apt intentions of healing, which seem chiefly to be of use for a new Cough, while as yet we have no suspicion of a Phthisis, or at least that it subsists without the manifest limits thereof; it now remains, after this general method briefly shadowed out, that we subjoin certain choice forms of Medicines appropriated to every intention. These though they are manifold and of divers preparations, yet those which are of chiefest note and most in use, are Mixture, Linctus's, Lohochs, Tinctures, Balsams, Troches, Lozenges, Powders, Pills, Decoctions, and distilled Waters. Of each of these we shall set down some choice Receipts.

1. Mixtures.

Take of Syrup de Meconio, of Jujubes, of each an ounce and half; of powder of Olibanum a dram, the water of Earth-worms, or of aq. Hysterica, or Peony compound a dram, mingle them. The dose is one spoonful at bed-time and after midnight.

Take of the water of Snails, of Earth-worms, of each an ounce and half; of the liquid Laudanum Tartarized two drams, Syrup of Violets an ounce. The dose is one spoonful at bed-time.

Take of Snail-water ℥vj, Syrup of the juice of ground-Ivy, ℥iij. Flower of Brimstone ʒss. mix them. The dose is one spoonful at bed-time, and soon in the morning.

Take of our Syrup of Sulphur 4 ounces, Water of Earth-worms 1 ounce. Dose 1 spoonful after the same manner.

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2. Linctus's.

Take of Syrup of Jujubes, Maiden-hair of each one \mathfrak{z} and half, Syrup of red Poppy's 1 ounce, mix them, to be lick'd with a Liquorish Stick.

Take Oyl of Sweet-Almonds fresh drawn, Syrup of Maidenhair, of each 1 ounce and half, white Sugar-candy 2 drachms, mix them by beating in a Glass-morter, or shaking them in a Glass Vial till it wax white.

3. Lohochs.

Take Conserve of Red Roses 2 ounces and half, Lohoch Sanum 1 ounce and half, Spec. Diatragacanth. frig. 1 dram and half, flowers of Brimstone half a dram, Syrup of Violets or red Poppyes as much as sufficeth, let it be made a soft Lohoch. Dose 1 dram and half at night and early in the morning; at other times to be licked with a Liquorish stick.

Take of the powder of the leaves of Hedg-mustard, or Rockets, 1 ounce and half, clarified Honey 4 ounces, mix them for a Lohoch, let it be administred after the same manner. It agrees with cold Constitutions.

4. Tinctures.

Take of Tincture of Sulphur, without empyreuma 3 drams, Dose from 6 drops to ten in the evening, and early in the morning in 1 spoonful of Syrup of Violets, or of the juice of ground-Ivy; I scarce know a more excellent remedy for any Cough, provided there be no fever.

Take of Tincture of the Sulphur of Antimony 2 drams, Dose 20 drops evening and morning in one spoonful of the pectoral Syrup.

Take the Tincture of Gum Ammoniack (prepar'd with the Tincture of Salt of Tartar) 1 ounce, Dose from 15 drops to 20. After the same manner the Tinctures of Galbanum, Assafoetida, Gum of Ivie (prepar'd after the same manner) are proper for a Cough in any cold Constitution.

5. Balsams

Take of Opobalsamum 2 drams, Dose from 6 drops to ten in a spoonful or two of Hyssop, or Penny-royal, or any other Pectoral water.

Take of the Balsam artificially distill'd, commonly call'd the Mater Balsami, two drams, Dose from 6 drops to ten in one spoonful of Syrup of Violets or Canary Wine evening and morning.

Take Balsam of Sulphur two drams, the dose from five drops to ten after the same manner.

Take of Balsam of Peru one dram, Dose from two drops to 4 or 6 in Conserve of Violets.

6. Troches.

Take of the Species of Diatragacanth. frigid. $\mathfrak{z}\mathfrak{ss}$. Liquorish $\mathfrak{z}\mathfrak{j}$. flower of Sulphur $\mathfrak{z}\mathfrak{j}$. flower of Benzoin $\mathfrak{z}\mathfrak{j}$. Sugar Penids $\mathfrak{z}\mathfrak{iij}$. make a Paste with the dissolution of Gum Tragacanth in Hyssop-water, form it into troches of the weight of $\mathfrak{z}\mathfrak{ss}$. Take one often in the day or in the night.

Take of the seeds of white Poppies $\mathfrak{z}\mathfrak{vj}$. of the powder of the flowers of red Poppies $\mathfrak{z}\mathfrak{i}$. extract of Liquorish $\mathfrak{z}\mathfrak{i}\mathfrak{j}$. milk of Sulphur $\mathfrak{z}\mathfrak{ss}$. Sugar Penids $\mathfrak{z}\mathfrak{i}\mathfrak{j}$. with mucilage of Quince-reds make a Paste, and form it into troches.

Take of the Species Diaireos, of the lungs of a Fox, of each $\mathfrak{z}\mathfrak{ss}$. Sugar Penids $\mathfrak{z}\mathfrak{i}\mathfrak{j}$. with the dissolution of Gum Tragacanth, make them into Troches.

Take of powder of Elicampane, Anniseeds, Liquorish, of each $\mathfrak{z}\mathfrak{i}\mathfrak{j}$. flower of Brimstone $\mathfrak{z}\mathfrak{j}$. of Tablet Sugar $\mathfrak{z}\mathfrak{i}\mathfrak{ss}$. juice of Liquorish dissolv'd, as much as will suffice, make Troches.

7. Lozenges.

Take of the Species Diatragacanth. frigid. $\mathfrak{z}\mathfrak{iij}$. powder of the flowers of red Poppies, milk of Sulphur, of each $\mathfrak{z}\mathfrak{ss}$. of Sugar dissolv'd in Poppy-water, and boyl'd to make Tablets, $\mathfrak{z}\mathfrak{iij}$. form lozenges of $\mathfrak{z}\mathfrak{ss}$. weight.

Take of Species Diaireos, of the Lung of a Fox, of each $\mathfrak{z}\mathfrak{iij}$. flower of Brimstone, powder of Elicampane of each $\mathfrak{z}\mathfrak{ss}$. of the whitest Benzoin $\mathfrak{z}\mathfrak{j}$. make them in a fine powder,

der, adding of Oyl of Anniseeds ℥j. Sugar'd dissolved, and boyled to a height to make lozenges ℥viij. for lozenges of ʒʒ8. weight.

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8. Powders.

These though more seldom, yet are sometimes given with success in a Cough, and Pneumonic distempers.

Take of the tops of Ground-Ivy somewhat reddish, a sufficient quantity, bruised let them be form'd into a Cake, which dried presently in the hot Sun, reduce into fine powder, and keep it in a glass. This plant keeps its virtue with smell and taste longer than any either Conserves or Syrups, and greatly profits in a grievous and pertinacious cough. Take from ʒʒ8. to a dram, in distill'd water, or pectoral decoction twice in a day.

After the same manner Powders of other pectoral Plants are prepared, and taken with benefit.

Take of Cup-moss or chin-cups ℥iij. milk of Sulphur ℥j. Sugar-candy ʒʒ8. make a powder; the dose from ℥j. to ʒʒ8. twice in a day. This powder is given with great benefit to those labouring with a chin-cough.

Take of the flour of Brimstone, Olibanum, Ceruse of antimony, of each ℥ij. divide it into xii. parts, take one part in the morning, and another in the evening in a spoonful of a convenient vehicle.

9. Pills.

Take of Aloes rosata, or rather of Ruffus's his Pill, flower of Brimstone of each one dram and half, flowers of Benzoin ℥j. Juice of Liquorish dissolv'd in as much Snail-water as will suffice to make a mass, form it into small Pills to be taken 4. at night to be repeated every or every other night.

Take of powder of Elecampane, Liquorish, flower of Brimstone, of each one dram, flowers of Benzoin half a dram, Tarr as much as is sufficient, form it into small pills, the dose 3 or 4, evening or soon in the morning.

Take of Millepedes or Hogs-lice prepared ℥ij. The powder of the seeds of Nettles, Burdock of each half a dram, Oyl of Nutmegs distilled ℥j. Salt of Amber half a dram, Juice of Liquorish what will suffice, form it into small Pills, take three in the morning and in the evening.

10. Decoctions.

These are taken either by themselves, or with the addition of Milk. Among those which are of the first kind, i. The Pectoral Decoction according to the London Dispensatory, offers it self. Which is taken twice a day from ℥iij. to vj. or ʒviiij.

Take of the leaves of Ground-Ivy, white Maiden-hair, Harts-tongue, Coltsfoot, Agrimony, of each one handful, Roots of Chervil, Knee-holm, of each one ounce, Carthamus and sweet Fennel seeds, of each half an ounce, boyl them in 6 pints of Spring-water to the consumption of half, adding towards the end Liquorish three drams, Raisins stoned two ounces, Juyubes, n° vi. or clarified Honey three ounces, make an Apozeme, clarifying it with the white of an Egge; Dose 6 ounces warm, 2 or 3 times in a day.

Decoctions taken with Milk, are used morning and evening instead of Breakfast and Supper, according to the manner following.

Take the flowers of greater Daisies one handful, three cleansed Snails, half an ounce of candied Eringo roots, Barly 3 drams, boyl them in a pint and half of water to a pint. Take 6 or 8 ounces warm, adding a little milk; and afterwards the quantity encreased by little and little.

After the same manner, Cup-moss, Ground-Ivy, St. John's-wort, and other pectoral herbs are boyl'd and taken with Milk.

The Decoction of Woods often does conduce much to the cure of a stubborn Cough, especially if appointed in the place of Beer, for ordinary drink, and taken for some time.

Take

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Take of the roots of Sarsaparilla 4 ounces, China two ounces, white and red Sanders of each half an ounce, shavings of Ivory and Harts-horn of each 3 drams, let them be infused, and boyled from 8 pints of Conduit-water to 4, adding Liquorish 6 drams, Raisins stoned an ounce and half; in a phlegmatick or colder constitution, add of shavings of Lignum vitæ.

II. Distilled Waters.

Every one may compound manifold and divers forms of these as occasion requires, and appoint according to the constitution of the Patient, sometimes simple Milk, sometimes Milk with some part of Wine, sometimes Ale, or *Brunswick Mum*. For a Sample we will prescribe the form of these.

Take of the leaves of ground-Ivy, Hyssop, Penny-royal, of each four handfuls, of Snails half-boyl'd in their shells two pounds, Nutmegs sliced n^o. vj. Upon all being cut small pour eight pints of fresh milk, let it be distilled in the common Organs, i. e. a Pewter-Still.

The dose 3 ounces twice or thrice in a day by it self or with some other Medicine.

Every dose let it be sweetened when it is taken with Sugar-candy, or with the syrup of the juice of Ground-Ivy.

In a constitution less hot, especially if there be no fervent heat of the blood or *Præcordium*, to fix or seven pints of Milk, add one pint or two of Canary wine; and in a phlegmatic or old body, instead of Milk let the *Menstruum* be Ale or *Brunswick Beer*, i. e. Mum.

Moreover, in Winter-season when Snails cannot easily or scarcely be procured at all, there may be substituted in their stead Lambs or Sheeps Lungs, also sometimes Calves, being half-boyl'd and cut small, with the forementioned ingredients, and a fit *Menstruum* being added, let them be distilled in common Organs, or Rose-stills.

The convulsive
Cough of Chil-
dren call'd the
Chin-cough.

To this form, treating of a Cough not yet arrived to a Phthisis, ought to be referred the convulsive or suffocation Cough of children, and in our Idiom called the *Chin-Cough*. This assaults chiefly Children and Infants; and at certain seasons, viz. Spring and Autumn especially, is wont to be epidemical. The diseased are taken with frequent and very fierce fits of Coughing, wherein namely the Organs of breathing do not only labour in pain, but also being affected convulsively, they do variously suspend or interrupt their actions; but for the most part the Diaphragma convulsed by it self, or by the impulse of other parts, doth so very long obstinately continue the Systole, or Diastole, that Inspiration, or Expiration being suppress'd for a space the vital breath can scarcely be drawn; insomuch that coughing as being almost strangled they hoop, and by reason of the blood stagnating, they contract a blackness in their countenance; if perhaps, those organs not in such a measure convulsed, they are able to breathe any thing freer; notwithstanding they are forced always to cough more vehemently and longer, until they wax faint.

The Reason
thereof.

The formal reason or conjunct cause of this disease, consists in these two things, viz. that there is present a quick and vehement irritation of the Lungs, whereby they are almost continually incited to throw off something troublesome by Cough; and also that the motive parts of the *Thorax*, viz. the Nerves and nervous fibres being pre-disposed to convulsions, as often as they are irritated, do excite a Cough not regular but convulsive, and such as is opposite or injurious to the usual function of breathing.

The cause partly
in Catarrh.

The matter provoking the Lungs so frequently into a Cough seems to be the Serum, incessantly soaking out of the mass of blood, by reason of its frame being too much loosened, and troubling the parts belonging to the breast, inasmuch as it distills as well through the tracheal arteries into the hollowness of *aspera arteria*, as that it is poured in plentifully through the *Pneumonic* arteries into all the open passages.

A convulsive
disposition of the
parts of the
breast.

The convulsive disposition of the moving parts, as in other convulsive distempers, seems to proceed from a heterogeneous and elastic matter falling from the brain through the nervous passages, together with the nervous liquor, into the small moving fibres of the breast; wherefore, when the spirits that are contained in those little fibres, are stirr'd to perform violent motions of breathing out, they pass into convulsive motions.

The prognostick
of this disease.

What relates to the Prognostick of this distemper, this Cough although it be seldom very dangerous or mortal, yet it remains very difficult of cure; and frequently it rather ceases by change of the season than is extinguished by remedies. The cause whereof is, that here not, as in an usual Cough, the blood onely ought to be altered, and its recrements to be derived out of the Lungs, to be conveyed to the habit of the body by sweating, but Moreover an amendment of the nervous juice ought to be procured.

About

About the curing of this disease, the way of healing used in other kinds of P H A R.
Coughs doth rarely profit here; wherefore old women and Empiricks are oftener con- Part. II.
sulted than Physicians, and the rational curatory method being postponed and neg-
lected, remedies for the most part onely Empirical are brought into use.

*Cures first Em-
pirical.*

Among the many remedies of this kind, these two following are preferr'd to all others, and chiefly wont to be used; viz. Cup-mofs or Chin-mofs or Chin-cups, and the various preparations thereof and compositions are taken inwardly, and if there shall be need of any further medicine, that some Bugbear being presented, the Child labouring with it may be cast into a sudden fright. But if the wished success wanting to administrations of this sort, Ptisans, Syrups, Julips, or Decoctions, and other pectoral helps are rejected, and frequently they desist from all other Medicines, expecting until the disease either at length of its own accord determine, or be cured by reason of the succeeding change of the year.

1. Chin-cups or Mofs is in most common use in our Countrey against the Coughs of Children, and is vulgarly enough known as to its form and manner of growing. It is of an astringent nature (as far as we gather by its taste) and contains in it self particles somewhat sharp and biting, and smelling of plenty of volatile Salt: from whence we may safely conjecture that its use is to fix the blood, and to appease the fluxes of Serum, and moreover by volatilising the nervous juice, to take away the convulsive disposition. It is usually administred in form of Powder, Decoction, and Syrup, according to the following Receipts.

*Chin-cups is
great remedy.*

*The reason
whereof is in-
quired.*

Take of Chin-cups in powder one dram, Sugar-Candy one Scruple, mix them, divide it into three or four parts, take a dose morning and evening with a fit vehicle.

Take of the same Cup-mofs two drams, milk of Brimstone two scruples, powder of Anniseeds one scruple, divide it into six parts to be taken as the former.

Take of the same Chin-mofs or cup-mofs one dram boyled in milk for one dose; take it morning and evening. To those with whom milk doth not agree, or to whom it little profits, let it be boyled in Spring-water or Hyssop-water, or in any other pectoral water, and let it be given from two ounces to four, twice in a day, sweetning it with Sugar or some fit Syrup.

Take of this Muscus Pyxidatus or chin-mofs one ounce, boyl it in two pints of some pectoral water to the consumption of half: to it strained add of Sugar-Candy one pound, and evaporate it in a gentle bath, to the consistence of a syrup.

2. The other remedy for the convulsive Cough is wont to be, that they be cast into some sudden fright; from hence, when as medicines effect less, with the vulgar it is a familiar practice, that, to fright them, while a great Mill is driven about with a screeking noise, and a dreadful aspect in the wheels, the distempered be put into the Trough or Receiver of the Grain or Corn, and from thence the sudden cure of this disease sometimes happens. The reason whereof without doubt consists in this, that the Animal Spirits being put to flight and forced into fresh distractions, they relinquish their former disorders; moreover, the convulsive matter is either dissipated by that disturbance, or is forced into other nerves where it is less troublesome.

*Frights profit
in this Cough.*

The Empirical cure of this disease being described after this manner, together with the remedies vulgarly used, and the rendring a reason of the cause at least probably unfolded, from hence it will be lawful to design rational method of curing, and perhaps more efficacious against childrens Coughs of this kind. Wherefore, in such a case sometimes successfully enough I have prescribed according to the following forms. And seeing we ought to begin with purging,

*The rational
cure.*

Take of the syrup of Peach flowers one spoonful, of Aqua Hysterica one scruple, mix it, and let it be taken with government. *Purging.*

Or, take of Mercurius dulcis 6 grains, Scammony prepared with Sulphur, Resine of Jalap, of each three grains; make a powder, give it in a little Pulp of a preserv'd Cherry to a lad six years old, and let the dose be encreased or lessened according to the age, let the Purge be repeated in 6 or 7 days.

If the Patient (as it often happens) be prone to vomit, Take of Oxymel of Squills 6 drams, Salt of Virriol 4 grains, mix it for a child of six years old, and according to this proportion let the dose be accommodated to others. I have known a Vomit of this kind taken every morning for four or five dayes together with good success.

Vesicatories or Medicines drawing blisters are in daily use, and are applyed sometimes to the Nucha or nape of the Neck, another while behind the Ears, then to the inside

Vesicatories.

P H A R. inside of the arms near the arm-pits, and as soon as these sores begin to heal in these places, let others be raised in other places.
Part. II. Instead of Beer let the following Decoction be used for ordinary drink:

Take China-roots an ounce and half, of all the Sanders of each half an ounce, the shavings of Ivory, and Harts-horn of each three drams; let them be infused and boiled in six pints of Spring-water to the consumption of half, adding Raisins stoned an ounce and half, Liquorish three drams.

Mixtures.

Take of Spirit of Gum Ammoniac with Salt Armoniac a dram, Syrup of Chin-moss three ounces, Aq. hysterica an ounce: the dose is a small spoonful in the evening and morning fasting.

Or, Take of tincture of Sulphur two drams, dose three drops in the evening and first in the morning in a spoonful of the Syrup of Cup-moss.

To some endued with a hot constitution, and while they cough their countenance is spread with redness, or rather blackness, I have prescribed Phlebotomy or drawing of blood with Leeches to two or three ounces with good success.

Take Hog-lice living and cleansed two ounces, powder of Aniseed a dram, Nutmeg half a dram, fine Sugar an ounce, bruise them together, and pour upon them six ounces of Hyssop-water, of Magistral Snail-water two ounces, stir them together a little, and press them out hard: the dose two or three spoonfuls twice a day.

Of what sort the beginning of a consumptive Cough is.

Three indications concerning its cure.

1. To stop the dissolution of the blood.
2. To draw out the filth from the Lungs.
3. To heal the Lungs hurt.

The first indication suggests three intentions of healing.

The first intention, that the nutritive juice may be proportioned to the blood and assimilated by it.

Hitherto of a Cough and its Remedy, while it is only an entrance to a Consumption; now it remains to treat thoroughly of the distemper it self, having passed the limits of this dangerous disease, and to design a method of curing, and the forms of remedies, which are proper to heal an inveterate Cough, when either being neglected, or not easily giving place to remedies, it begins to degenerate into a Phthisis; namely when it arrives to that state, that the blood being dissolved in its consistence, doth not only pour out the superfluous Serum, but also the nutritive Juice, and perhaps the nervous, the Lympha, and other its superfluities on the Lungs, and lodges them within its passages; and in the mean time the corruption of the Lungs is so much encreased, that the little Bladders being distended, or many of them broke into one, so that a solution of continuity or an Ulcer being caused, a greater plenty of corruption is daily heaped in; and moreover the matter in that place gathered together, because it is suffered to abide there long, putrifies, and for that reason doth still more corrupt the Lungs themselves, and defile the blood flowing through. In this case the Therapeutical indications shall be chiefly these three: viz. in the first place to stop the dissolution of the blood, which is the root of all this evil, and to make provision that it pour not out the matter any longer in such abundance upon the Lungs. Secondly, by expectorating the purulent matter heaped up within the Lungs, and to evacuate it quickly and sufficiently. Thirdly, to strengthen and dry the Lungs loosed from their unity, or being too loose or moist or otherwise infirm, lest they be daily more and more corrupted, and give more reception to the morbid matter. Every of these indications suggests various intentions of healing, and requires remedies of divers kinds and many ways of administrations. The chief of which we shall here briefly treat of.

1. Therefore what the first indication suggests, that the dissolution of blood may be prohibited, these three things (as much as may be) ought to be procured: viz. First that the mass of blood may contain and assimilate whatsoever of nutritive juice it may be furnished with; and that it be so proportioned, that it neither offend in quality nor in quantity. Secondly, that the acidities either generated in the blood, or poured into it from some other place, may be so destroyed, that the blood retaining as yet its mixture or temperament, may not be prone to flowings and pourings out. Thirdly and lastly, that all the excrements produced in the blood may be derived from the Lungs to other Emunctories and places of Evacuations.

i. As to the first intention of healing, viz. that the nutritive Juice may be proportioned to the blood, let it be advised before all things, that they who cough and are phthisical abstain chiefly from drink, and that they take liquid things in a very small quantity; for that the blood being infirm in its temperament, so long as it is not too much imbued with fresh juice, may be able to digest small portions, and retain it within its own consistence. Moreover, let that fresh juice consist of such kind of particles, which being mild and thin, may be tamed by the blood, and assimilated without any effervescence or heat. Wherefore Asses milk, also sometimes Cows or Goats milk; also Water-gruel, Cream of Barley, Ptisan, Almond-milks, and other simple

simple nourishments will better agree and nourish more than Flesh, Eggs, and Gelly-broaths, strong Ale, Wine; or any other kind of richer fare. Secondly, that the blood retaining its own temperament, be not easily dissolved into serolities injurious to the Lungs, it behoves that as well the acidities of it self as of other humors mixt therewith, and chiefly the nervous and limpid ones be destroyed: which intention Medicines prepared with Brimstone will best accomplish; which for that cause in this case (provided a hectic Fever be not present) may be more frequently and in abundance taken. Wherefore the Tincture, the Balsam, the Syrup, the Flowers, and Milk of Sulphur in somewhat a large Dose may be exhibited twice or thrice a day. For the same reason traumatic or vulnerary Decoctions, also Decoctions of the pectoral Herbs commonly so called, also of the Woods, are to be taken instead of ordinary drink. Moreover the Powder of Crabs eyes, Hog-lice, and other things endued with an Alkali or volatile Salt are often administered with great success. The third intention of healing respecting the first indication, viz. that the superfluous dregs of the depraved blood, (if they shall be very much predominant) being commanded out from the Lungs, may be discharged by other Emunctories, suggests very many ways to be used for their dispatch: For besides Phlebotomy, Diuresis, and sometimes a gentle purgation (which take place in all Coughs, yea in the beginning of a consumptive Cough, or Phthisis) hither also ought to be referred Baths, taking in a more warm air whereby they may more freely transpire, also Frictions of the extreme parts, Dropaces, Issues, Blisterings, or Depilatories, Errhines, Gargles, and other private or public sluices either of umors or vapours.

The second indication in the beginning of a Phthisis, viz. that the Consumptive matter laid aside within the Lungs may be easily and daily evacuated, is performed by expectorating Medicines. These are said to operate after a twofold matter, according to which their virtue is conveyed two ways to the Lungs. For of those being taken by the mouth, some immediately dismiss their active particles into the Trachea, which partly by making the way slippery, and loosning the matter impacted, and partly by provoking the excretory Fibres into Convulsions, do procure expectoration: in which number are chiefly accounted Linctus's, and Fumigations. The expectorating Remedies of another kind, which deservedly are accounted more available, do exercise their energie by the passage of the blood. For whereas they consist of such kind of particles which cannot be digested and assimilated by the mass of blood, being spread through the blood, because they cannot be mixt with it, they are presently again exterminated, and so penetrate from the Pneumonic Arteries into the Tracheal passages; where lighting on the matter they divide, and attenuate, and so disturb it, that the little fibres being irritated from thence, and successively contracted while they Cough, the contents of the Trachea and of its little bladders are ejected upwards into the mouth. Medicines proper for this use besides Sulphur and the preparations of it, are artificial Balsams distilled with Oil of Turpentine, Tinctures and Syrups of Gum Ammoniac, Galbanum, Asa foetida, Garlick, Leeks, and such like yielding a strong scent; from which also Lohochs and Eccelegam's are prepared. And these work both ways, partly by slipping into the Trachea, and partly by entering the Lungs by the circulation of the blood, and assault the morbid matter both before and behind, and so exclude it with the greater force.

3. What belongs to the third indication, viz. that the frame of the Lungs being hurt, or their constitution vitiated, may be either restored or amended; such things are of use as resisting putrefaction do cleanse, heal, dry, and strengthen; to which intent also Remedies prepared of Sulphur, Balsamicks and Vulneraries do agree. Hence some Empirics do not only successfully prescribe the Smoak of Sulphur vivum, but also of Auripigmentum, to be sucked through a Pipe or Funnel into the Lungs. Moreover it is for this reason, that change of air and soil, viz. from Cities to the Country or sulphureous air, or the passage from one Region into another that is hotter, is of such a signal advantage.

Hitherto of the Method of Healing, which seems to be of use against the more painful Cough, or Phthisis beginning; now it remains according to all those curatory indications to subjoin certain select Forms of Medicines, which also, according to the way of healing described above in a slight Cough which is short of a Phthisis, we shall distinguish into certain ranks, viz. which are Mixtures, Linctus's, Lohochs, Tinctures, Balsams, Troches, Lozenges, Powders, Pills, Decoctions, and distilled Waters. We shall set down some Examples of each of these: whereto also may be referred some of the forms of Medicines before described for a beginning Cough, and not as yet consumptive.

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2. That the acidities of the blood and other humours be taken away.

3. That the excrements of the blood be drawn off from the Lungs.

Second indication requires expectorating Medicines.

Third indication is performed by Balsamicks and vulneraries.

Forms of remedies for a consumption.

P H A R.
Part. II.

1. Magisterial Medicines and Syrups.

Mixtures.

Take of our Syrup of Sulphur three ounces, water of Earth-worms an ounce, tincture of Saffron two drams, mingle them. Take one spoonful at night, and first in the morning.

Take of Syrup of the juice of Ground-Ivy three ounces, Snail-water one ounce, flour of Brimstone a dram, mix them by shaking. The Dose one spoonful at night and morning.

Take of tincture of Sulphur two drams, Laudanum, tartarizated a dram, Syrup of the juice of Ground-Ivy two ounces, Cinnamon-water two drams the dose one spoonful at bedtime, and if sleep be wanting, towards morning.

Syrupus Diasulphuris.

Syrups.

Take of Sulphur prepared after our manner half an ounce, best Canary wine two pints, let them be digested 28 hours in a water or sand Bath; which being done, take of the finest Sugar two pounds dissolved in Elder-flower-water, and boyl to a height to make tablets: afterwards pour to it by little and little Wine coloured with Sulphur and warm, set it to boil a little on the fire, strain it through Woolen. You will have a most delicate Syrup of a gold colour, and for Coughs and other Distempers of the Lungs (where a Hectic Fever and heat of the Pericardium is absent) most profitable: the dose a spoonful morning and evening by it self or with other Pectorals.

Syrup of Garlick.

Take ten or twelve cloves of Garlick stript from the little skins, and cut into slices, Ani-seeds bruised half an ounce, Elicampane sliced three drams, Liquorish two drams, let them digest for two or three days in a pint and half of spirit of Wine close and warm; strain it clear and hot into a silver dish, and add a pound and a half of fine Sugar, the dish standing upon hot coals, let the liquor be fired, and while it burns stir it; and strain it through woollen, and keep it for use.

Syrup of Turneps.

Take Turneps sliced and fine Sugar of each half a pound, put them in a glazed pot a lay of Turneps and a lay of Sugar, the pot being covered with paper, put it into an oven to bake with the bread; when it is taken out, press the liquor, and keep it for use: the dose one spoonful morning and evening.

Syrup of Snails.

Take fresh Snails with their shells n. xl. cleanse them with a Linnen cloth, afterwards each being run through with a bodkin, let the open shell be filled with powder of Sugar-candy, and being put in a linnen bag, let them be hung in a cellar, it will dissolve into a Syrup and drop into a glass vessel set under it: the dose one spoonful twice or thrice a day in a convenient vehicle, viz. Milk-water or pectoral Decoction.

2. & 3. Linctus's and Lohochs.

Linctus's.

Take of conserve of red Roses three ounces, of our tincture of Sulphur two drams, mix them in a glass mortar: the dose the quantity of a Nutmeg evening and morning. To this sometimes to appease a troublesome cough add from half to a dram of powder of Olibanum.

Lohoch.

Take conserve of red Roses four ounces, flour of Brimstone four scruples, fine oyl of Turpentine a dram, powder of Fox-lungs three drams, Syrup of the juice of Ground-Ivy as much as will suffice to make a soft Lohoch, to be taken after the same manner, viz. morning and evening; also to be licked at other times with a Liquorish-stick.

Take powder of Sugar-candy four drams, tincture of Sulphur two drams, mix it in a glass mortar: take it after the same manner.

In the place of Tincture of Sulphur may be administered other Balsamic Tinctures, viz. Balsam of Peru, Opobalsamum, Gum of Ivy, Guajacum, Amber, with many other, which either may be mixt with Conserve of red Roses, or with the Conserve of the flowers of Colts-foot, or with Sugar-candy.

4, 5. Tinctures and Balsams of the same nature and composition, but in a larger Dose are convenient in a Phthisis, which we have above prescribed for a beginning Cough.

Tinctures.

Take of Tar an ounce, Lime-water thrice cohobated two pints, distil it in a Bath to half, afterwards being filtrated, let it be drawn off to the consistence of Honey in Balneo; to which

pour

pour half a pound of tincture of salt Tartar, let it digest in a close glass to extract the tincture: the dose from 20 drops to 30 in a fit vehicle. After the same manner is prepared the tincture of the black oyl of Soot, liquid Amber, liquid Storax, and many others.

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Take of our prepared Sulphur an ounce, adding Mirrh, Aloes, and Olibanum in treble quantity, draw off a tincture with oyl of Turpentine, also with rectified Spirit of Wine: dose from 15 drops to 20.

6, 7, 8. Troches, Lozenges, and Powders, because they chiefly respect a Cough, are almost of the same nature and composition with those before-described for a new Cough; unless that for the drying and healing of the Lungs things sulphureous and Vulneraries are required in a greater proportion.

Take powder of the leaves of Ground-Ivy a dram, flour of Brimstone two drams, of Sugar penids a dram and half, with juice of Liquorish dissolved in Hyssop-water make troches of the weight of half a dram.

Take of Tarrow bruised and dried in the Sun half a dram, flour of Brimstone, Olibanum, Powder of each a dram; powder of dried red Roses half a dram, Sugar dissolved and boiled to a height six drams, oyl of Aniseeds a scruple and half, make Lozenges of half a dram weight: take one three times or oftner in a day, and especially evening and morning.

9. Pills.

Take a pint of the juice of Ground-Ivy clarified in the Sun, flowers of Colts-foot dried, the tops of Hyssop, Sage, Pennyroyal, each a handful; Aniseed, Caraway-seeds, sweet-Fennel-seeds bruised, each half an ounce; distil them in Balneo Mariae to half; strain it and distil it to the consistence of Pills, by adding half a dram of juice of Liquorish, powder of Elicampane, flour of Brimstone, each three drams; flowers of Benzoin a dram, Balsam of Peru half a dram, tincture of Sulphur three drams, tartarized Laudanum two drams: make it into a mass, and form it into small Pills to be taken three or four evening, and first in the morning.

10. Decoctions, as I have above prescribed for a stubborn Cough, are used with success against a beginning Phthisis. In a case almost desperate I have prescribed the following Decoction to be taken twice aday, and also instead of ordinary drink with very good success.

Take Lignum vita four ounces, China, Saffaphras, each two ounces; of all the Sanders each an ounce, shavings of Ivory, Harts-horn, each three drams: infuse them, and boil them in twelve pints of Spring-water to half, adding Liquorish an ounce, Raisins stoned four ounces: strain it.

11. Distilled Waters, such as we have before prescribed, are specific here, whereto may be added Solenander-water, of Hogs blood and Turpentine; also Balsamic Waters distilled from Turpentine with Pectoral Ingredients.

Take leaves of Ground-Ivy, white Horehound, Hyssop, Pennyroyal, each three handfuls; roots of Elicampane, Orris of Florence, each two ounces; Turpentine dissolved in Oyl of Tartar four Ounces, Hyssop-water four pints, Malaga wine two pints; distil them in a sand Bath: let all the liquor be mixed, the Oyl separated: the dose two or three Spoonfuls twice aday, with a Spoonful of Syrup of Ground-Ivy.

12. In the last place we must describe the forms of Vapors and Fumes; the administration whereof doth use to profit more than any other remedies in a Phthisis not yet desperate, for that they arrive at the very Lungs, and so purge them by an immediate affect, dry them, and keep them from putrefaction, strengthen and open all their passages, 1. Therefore a moist steam may be made after this following manner.

Take leaves of Hyssop, Ground-Ivy, white Horehound, each two handfuls; Elicampane two ounces, Calamus aromaticus half an ounce, Aniseeds, and Caraway-seeds, each an ounce: former boil them in a sufficient quantity of Spring-water: let the vapor of the hot strained liquor be drawn by the Lungs through a paper rolled up like a cone or funnel: and used morning and evening for a quarter of an hour.

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2. A fumigation or dry vapour, is made one while more mild out of meer Balsamics, another while more strong out of Sulphurs, and sometimes out of Arsenicals.

Forms of the more gentle Fume.

Take of Olibanum, white Amber, Benzoin, of each two drams, Gum Guaiaci, Balsam of Tolu of each one dram and half, powder of red Roses, and red Sanders, of each one dram to be strewed upon burning coals.

Of the more strong.

Take Gum of Ive, Frankincense, of each two drams, Flower of Brimstone one dram and half, Mastich one dram, with a dissolution of gum Tragacanth, form Troches.

Arsenicals.

Take of white Amber, Olibanum, of each two drams, prepared Orpiment half an Ounce, Styrax, Labdanum, of each one dram and half, with solution of Gum Tragacanth, make Troches for fumigation.

Smoke of Arsenick.

Mountebanks do ordinarily prescribe the smoke of Arsenick to be sucked into the mouth, like Tobacco kindled in a Pipe, and sometimes with good success: Moreover it is in practice with the Vulgar, to burn like Tobacco in a Pipe little bits of cloth stained with Arsenick (such as wherewith the walls of Taverns are hung) and so suck the smoke into the consumptive Lungs for cure.

Of a confirm'd Consumption.

3. These things being thus unfolded concerning a Cough, and a Phthisis beginning, both as to what belongs to the Pathologie, and cure; it remains now lastly to discourse of a more painful Phthisis confirm'd, and almost desperate; and to consult what is to be perform'd, when the Lungs being very much vitiated and affected with one or more filthy ulcers, neither the air nor the blood do rightly pass through them, but choke or corrupt the mass thereof, by continually suggesting filthy corruption; insomuch that a hectic fever and an Atrophie, by reason of nourishment being frustrated infest the diseased, with the loss of all their faculties, and by daily weakening their strength precipitate them to the grave. The most certain sign of this disease growing desperate, uses to be accounted a pain very troublesome with an inflammation of the throat; for this symptom argues a great putrefaction of the Lungs from whence the putrid effluvia's exhaling are thrown about in the narrow passage of the throat, which wound and grievously irritate those tender fibres there. In this case the cleansing of the Lungs, as also the drying up of the Ulcer are in vain designed: for all hotter Medicines ordain'd for those purposes, and fit enough in the beginning of a Phthisis, are not to be endured in a confirmed one; inasmuch as augmenting the inflammation of the Lungs they procure a hectic fever, thirst, watchings, and other more painful symptoms, or call them back afresh. For truly in such a state of this disease where only the prolongation of life is proposed with a little toleration and an easy death; those remedies help chiefly, which bridle the fervour of the blood, allay the heat in the *Præcordia*, and restore the spirits, and gently cherish them. Hence for food, Asses Milk, also Water-gruel, Barly-broths, Cream of Barley; and for drink, Ptisan, Emulsions, water of milk distilled with Snails and temperate pectoral herbs, are usually of greatest success. Syrups and Linctus's, which appease the inflammation of the Throat and Lungs, and facilitate expectoration, but chiefly the more mild Hypnoticks, whereby moderate rest may be procured, may be frequently or daily taken. The forms of these are common enough; but however according to our method we will annex some of the more select of each kind.

The formal reason thereof.

Forms of remedies in a desperate Consumption.

Decoctions.

Take of Barly half an ounce, candied Eringo roots 6 drams, parings of Apples one handfull, Raisins stoned two ounces, Liquorish three drams, boyl them in three pints of spring-water to two, make a Ptisan to restrain thirst: take it 3 or 4 times aday, also in the room of ordinary drink if it agree.

Take the tayls of twenty Crevises, candied Eringo roots one ounce, a crust of white-bread, Raisins stoned two ounces, Liquorish 3 drams, boyl them in 3 Pints of Spring-water to two, strain it, and take 3 or 4 ounces three times aday. After the same manner is prepared the Decoction of Snails.

Distilled waters.

Take of Snails half-boyled and cut three pound, ground-Ivy 6 handfulls, Nutmegs sliced numb. 6. crum of white-bread two pound, fresh milk 8 pounds, distill it in a Pewter Still. The same way is distilled the water of Crevise-tayls. The dose 3 or 4 ounces three times aday, sweetned with pearl'd Sugar or Sugar of Roses.

Hypnoticks.

Take ears of green Wheat as many as convenient, distill them in a common still; drink three or four ounces three times aday, sweetned with pearl'd Sugar.

Eclegmas.

Take Syrup de Meconio three ounces, water of green Wheat 6 ounces, mix them, drink two or three spoonfulls at bed-time, every or every other night.

Take Conserve of Mallow-flowers wild or garden three ounces, Lohoch de pino two ounces

res, Syrup of Fijubes two ounces, make a Lohoch, of which take often a dram and half, or two drams.

PHAR.
Part. II.

What hitherto we have discoursed of concerning a Cough of every kind (whether it be solitary and simple, or the forerunner and companion of a Phthisis) also what is to be prescrib'd in every case touching the method of healing, it would be easily illustrated by the history of Cures, or by the Anatomical observations on those that have dyed by that disease. For instances of this sort, and very many examples are every where had, and happen daily; it pleases us here to annex a few of the more select out of the large choice of these, accommodated to the chief kinds of a Cough, and Phthisis. And first I will endeavour to illustrate the type of a simple Cough by one history or two, and which takes its rise of it self, and is altogether void of the suspicion of a Phthisis.

It is now many years since I took care of the health of a certain Student, obnoxious to a Cough from his tender years, and who was wont frequently to undergo the more painful affections of it, and those of long continuance. This person seemed of a melancholick temper, of a sharp wit, of an indefatigable spirit, of a constitution indifferently strong, but that his Lungs originally being infirm, did suffer when the blood dissolv'd into serosities. In Summer as long as he transpired freely, he lived healthily enough; but in the Spring and Autumn, when the blood changing its temperament, those serous fluxes came upon him either of their own accord, or from any sleight occasion, he fell easily into a Cough with abundant and thick spittle; notwithstanding this distemper frequently within six or seven dayes, as soon as the mass of blood was purged throughly by the Lungs, vanished leisurely without any great use of remedies. But if to the aforesaid occasions of this disease were added some stronger causes, as chiefly the obstruction of the pores, and errors touching his diet, sometimes a more prodigious and stubborn cough, neither presently nor easily yielding to remedies, and threatening nothing less than a Phthisis, did come upon him; then manifestly the patient for the first days suffered light shiverings in his whole body, and the sense of a Catarrh in his *Larynx*; afterwards by frequent coughing with thin spittle, together with a giddiness, he was afflicted with numbness of his senses, and a dropping at his nostrils.

In this state his best remedy was wont to be, and frequently tryed with success, to drink a little more freely generous Wine, and any other liquor very sparingly: for so the acidity and fluor of the blood being suppressed, and transpiration procured more freely, he was much eased, and sometimes recovered health in a short time. Moreover at night and early in the morning he was used to take seven or eight drops of the tincture of Sulphur in a spoonful of Syrup of Violets, or of the Juice of Ground-Ivy, or

Take Conserve of red Roses three ounces, spirit of Turpentine two drams mingled, the dose the quantity of a chesnut evening and morning.

If that these remedies together with the *Canary Antidote* and thin diet effected little, the disease not being so cured, spinning out into a long period, and pressing him sharply for many weeks, yea sometimes months, it reduced the sick to a remarkable leanness, and to the very brink of the Grave. For then the Cough daily encreasing and being very troublesome, did very much impede and break his sleep, his strength languished, his appetite was dejected, heat and thirst molested him; in the mean time spittle every day encreased, and was cast forth in great plenty; so that not only the Serum of the blood, and the recrements, but also the nutritive Juice, and the drainings of the solid parts being continually poured out upon the Lungs, turn'd into corruption, which was abundantly cough'd out; moreover his breath was difficult, his joints very infirm, and his flesh very much consumed.

When of late our Patient laboured after this manner, we prescribed the following method, and remedies, by the continued use whereof at length he recovered his health. First of all, a thinner diet being appointed him, and for the most part Ale being forbidden altogether, he took twice in the day of the following Apozeme about six ounces warm, and a little at other times cold to restrain his thirst.

Take of the roots of China two ounces, Sarsaparilla three ounces, white and yellow Sanders of each one ounce, Ivory and Harts-horn of each three drams; infuse and boyl them in 8 pints of water to half, adding Raisins of the Sun 3 ounces, Liquorish 3 drams, strain it, and keep it for ordinary drink.

Take

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Take Tincture of Sulphur three drams, take from seven drops to ten, at night and in the morning, in a spoonful of Syrup of Violets, or of syrup of the juice of Ground-Ivy.

When he began by continual use to nauseate this Medicine, in its place the following Eclegma was appointed.

Take conserve of red Roses three ounces, spirit of Turpentine two drams, mix them; the dose is one dram, at the same hours.

Afterwards instead hereof the following Powder was sometimes taken.

Take of the powder of the leaves of ground-Ivy dried in the Summer Sun three ounces, Sugar-candy half an ounce, mix them, the dose half a spoonful twice in a day, with three ounces of the following water.

Take Ground-Ivy 6 handfulls, Hyssop, white Hore-bound, of each 4 handfulls, Lambs-lungs half-boyl'd and cut small, pour upon them eight pound of Posset-drink made with small ale, distil it in common Organs, the liquor being mixed, let it be sweetened to the taste as it is used with Sugar-candy or Syrup of Violets.

Troches.

To appease his almost continually troublesome Cough, he swallowed the following Troches, and sometimes a little of the extract of Liquorish.

Take of the Species of *Diarragacanth. frig.* 3 drams, Annise, Carue, sweet Fennel-seeds, of each half a dram, flower of Brimstone two scruples, flowers of Benzoin one scruple, extract of Liquorish dissolv'd in Hyssop-water; make a paste which form into Troches. Or,

Take of Species *Diaireos*, e pulm. *Vulpis*, of each two drams, flower of Sulphur, of *Elecampane*, of each half a dram, Oyl of *Amisceds* ℞ss. Sugar dissolv'd in a sufficient quantity of *Penniroyal-water* and boyl'd to a body ℞vj. form Lozenges of half a dram weight, let him eat one, swallowing it by degrees, as oft as he will.

In the midst of this course, although he was endowed with a weak pulse and more cold temperature, we breath'd a vein in his arm: moreover, with these remedies, the chiefest help accrued to him from the open air, which for the most part he daily enjoyed, either by riding on Horse-back, or in a Coach; for from hence he first began to recover his appetite, his digestion, and sleep; whereto afterwards a relaxation of the other symptoms did sensibly follow, till at length he recovered his entire health. As often as he was afflicted since then with a stubborn and tedious Cough, he used a method like this, and with the like success; and now although he lives altogether exempt from that distemper, notwithstanding he is constrained to decline carefully all occasions or causes whereby either the pores might be shut, or the flux of blood or its precipitation into serosities might be provok'd; which were chiefly his going by water on the *Thames* at *London*, and drinking of acid liquors, as Cider, French or Rhenish wine.

From the above-mentioned history, you may easily conceive both the means and the reason of healing of the Cough, (which caused by the fault of the blood, is without the limits of a *Phthisis*): The other follows, which illustrates the nature of the same distemper, when it chiefly proceeds from the nervous juice.

The second remarkable History.

A hooping Cough.

A Boy about ten years of age, of a hot temper and fresh countenance, from his infancy obnoxious to a frequent Cough, in his succeeding years sustained more grievous and lasting fits and assaults of this distemper, and by turns was used to labour with a strong and shrill Cough, without spitting, which almost continually afflicted him day and night, and so infesting him many days, yea weeks, brought the sick to utter weakness. Afterwards the period of his disease being come (which happened not but by consuming the store of the morbid matter) he again in a short time became healthy enough, and very free from any sickness of the Thorax: till the morbid matter (as it seems) being heaped again to great abundance, without any evident cause, the same distemper returned and performed its Tragedy with its wonted fierceness. About its first beginning the Cough was troublesome only morning and evening: afterwards the evil by little and little increasing, he almost continually coughed whole days and nights, and if at any time sleep happening of it self, or by the use of Anodynes, afforded any truce, a more outrageous fit of coughing succeeded his waking. After this manner most frequently and fiercely coughing without any spittle, he laboured for three or four weeks, till he was brought to an extreme leanness and weakness; and then the sickness leisurely remitted, so that he coughed somewhat seldomer, and enjoyed moderate sleeps;

deeps; afterwards in few days growing very hungry, being quickly made full of flesh and vigorous, he recovered his former health in a short time. Fits of this kind more seldom infested him in Summer-season, but in the rest of the year, repeated three or four turns, and brought the sick even into great hazard of life.

If disquisition be made of the nature, causes, and formal reason of this unwonted end as it were, irregular kind of Cough, it is manifest it proceeds like all others, from the provocation of the Lungs; nevertheless as to the matter exciting, its seat, and manner of affecting it is doubted: because neither thick spittle nor plentiful thin (as is usual in other distempers) is here cast out; neither doth the Patient complain of feeling a Catarrh, nor of any weight of the Lungs. Wherefore, not as in a common Cough, does the serous humour either slowly or plentifully sweating out of the Trachea or Pneumonic vessels into the little bladders or Pipes of the Trachea, induce the afore-mentioned symptoms; But it is plain from thence that the passages of the *Arteria* are wholly empty of the serous or thick humour, because the deep and sounding Cough throws off nothing. Moreover, neither from the blood impacted in the Membranes of the Lungs, doth this Cough take its origine, because neither fever, nor thirst, nor pain, are present here as in a Peripneumonie. Besides, neither doth the morbid matter seem to adhere to the nerves or muscles appointed to the function of breathing; because then besides a Cough, Asthmatical or otherwise convulsive fits would sometimes urge with a sense of a strangling; which notwithstanding did not happen to our Patient.

Having frequently and seriously meditated about the *Ætiologies* of this very difficult case, I am at length induced to think, that a certain serous and sharp matter, as being loaded with a scorbutical taint, falling from the head by the passage of the nerves, doth enter into the nervous Fibres and Membranes of the Lungs or Trachea; which cleaving thoroughly to them, is by degrees encreased to a fulness, and at length being chaf'd, and grown turgid with a perpetual provocation, creates so troublesome a Cough. We have in another place declared the matter of this kind impacted in the Coats of the guts, and the neighbouring parts about them, not rarely to excite a scorbutical Cholick, for many days, yea sometimes weeks, infesting them with vomiting and most sharp torment; and what else is this Cough, but a certain Convulsive Distemper of the Lungs, whose taint notwithstanding, according to the capacity of the part labouring, is impress'd rather and more on the motive, than on the sensitive Power. For the Lungs however twicht and hurt, do suffer small pain, or scarce any at all; notwithstanding from any light occasion, they are invaded by storms and fits of Coughing. Indeed we compare this distemper of coughing so much the rather to the Cholick, because the subjects of either of them, that is to say, the Trachea, and the guts, as to their coats, vessels, little fibres and glandules, are after the same manner fashioned.

*The conjunct
cause of the Dis-
ease.*

The chief cause of the Cough now described, depends upon the morbid matter heaped together within the little fibres of the rough Arteries to a provoking fulness; wherewith when they are loaded, first a quick and painful breathing infests only, with a mornings Cough; because from the beginning only some small portion of that matter being disquieted provokes the part: afterwards when the whole mass thereof growing turgid, almost perpetually twitches the fibres, there follows a most troublesome Cough; which also being often repeated, endures a long season; because the Morbid mass impacted in the parts affected, is neither presently cast off by the strength of nature, nor easily gives place to any remedies.

For in all the fits of this Disease, I have made tryal of various methods of curing, and of Medicines of divers kinds, though with little success. That distemper beginning at any time, is wont to make a long period, maugre all remedies. The medicines commonly called Pectoral, as Syrups, Lohochs, Eclegmas, or Lambitives, have conferred little benefit to its cure; notwithstanding sometimes it hath seemed good to admit of them into use for this purpose, that they might make slippery and moisten the Lungs, lest they run the hazard of being rent by a violent Cough, and their vessels burst asunder: for sometimes a more fierce fit troubling our sick Patient, he hath been wont to Cough out a little blood, though no thick spittle.

A gentle Purge both in the beginning and declination of this Distemper hath succeeded well. Opening and diuretical Apozemes are ever administred with success, both which he used enough through his whole course instead of ordinary drink. Evening and Morning he took some drops of the Tincture of Sulphur with the Milk-water of Snails; late at night I was sometimes constrained to administer a Dose of Diacodium or of liquid Landanum: his belly for the most part loose enough, that it seldom required Clysters: in two of his fits he breathed a vein; whereby nothing of success ensued.

P H A R
Part. II.*The usual method
of curing.**A Drink.**A Mixture.*

In the last fit, beginning about the Autumnal Equinoctial, which passed away a little more lightly and gently, this following method of healing was observed.

First of all this Purge was given, and after four days repeated. *Take of Mercurius dulcisten grains, Resine of Jallop four grains, mix and make a powder to be taken in a Spoonful of Syrup of Violets.*

Take China-roots sliced a dram, Grass-roots three ounces, Chervil an ounce, candid Eringoes six drams, shavings of Ivory, Flatts-horn, each three drams; Raisins of the Sun stoned three ounces: boil these in three pints of Spring-water to two pints, strain it and use it for ordinary drink.

Take Syrup of Jujubes two ounces, Diacodion an ounce, Spirit of Salt Armoniac with Gum Ammoniac a dram, mix them: the dose a spoonful at night and early in the morning. He was much relieved with this Medicine, notwithstanding he took it only every other or third day, and for change sometimes a dose of the tincture of Sulphur with Syrup of Violets.

The Disease declining a Purge was twice repeated, and afterwards, recovering his health by degrees, within two weeks he became healthy enough. But when I beheld him not only obnoxious to frequent relapses of Coughing, but every fit to be irresistible when it assaulted him, and its stay very long notwithstanding the use of remedies, and all this threatening no less than a Phthisis at length; I advised that as well for his preservation, as for the more easie Cure of the Distemper, if it should return, he should travel into a hotter Region. Hereupon he did not much delay, but sails into France about the beginning of November, and from thence by a strait journey to Montpellier, where abiding half a year he was sick only twice and both times lightly: afterwards returning into England quite free from a Cough, praise be to God he enjoys his perfect health.

SECT. I. CHAP. VII.

Of Spitting Blood.

Hitherto of a Cough and Phthisis, as well in its beginning as confirmation; which are the most common affects of the Lungs, and most especially dangerous. Besides which there are many other Diseases of those parts that do occur, which when they are not at all, or not seasonably enough Cured, for the most part degenerate into a Phthisis. These passions, or at least the chief of them, (as we have before hinted) are spitting of blood, an Impostume, or Ulcer of the Lungs, a Peripneumony, Empyema, a Pleurisie, a Tumor of the Lungs, and obstructions by reason of things divers ways concreted, viz. sometimes little Pustles and Scirrhus's, another while gravel and little stones, and sometimes other preternatural matter; and lastly hitherto belong an Asthma and convulsive distempers of the Breast. Of these we shall treat in order, and first of Spitting blood.

*Spitting blood
a distemper
very frequent.*

The spitting blood out of the Lungs, and the ejections thereof by Cough sometimes less and almost none, another while more violent, is a Distemper frequent enough, and truly an admiration it is, that it happens not more frequently. For whereas the vessels bringing blood are divided into twigs and innumerable slips, and those very small; and whereas the blood even fiercely boiling, is violently conveyed through them all, complicated after divers manners and variously intorted; we can hardly conceive how the circulation thereof being so perplexed and intricate, and also so impetuous, should be performed without some impediment and interruption. And truly we conclude it to be very difficult in living bodies, because it hardly succeeds by injection in the dead: for as much as liquor sent through the entrance of the Pneumonic Artery, will not readily and easily return by the Veins; but sticking longer in the passage, and skipping over the usual passages, variously runs out into the little bladders and other canals of the Trachea, and into the interspaces and other various gaps of the little Lobes.

*Three things to
be considered
concerning it.**Out of what
vessels the blood
bursts out.*

Concerning an Hæmoptosis or spitting blood we are to consider, first out of what vessels, and by what distemper the blood bursts out; secondly in what places most frequently laid up; thirdly by what means it is wont either to be ejected or brought upward, that it may be discharged by the mouth.

As to the first, we are to suppose by the Law of Circulation, that the blood of it self bursting out, doth altogether proceed from the Arteries: for the Veins, as long as they remain whole, do reduce it towards the Heart, and not at all pour it out; although we deny not that sometimes they being hurt by a wound, fall, bruise, or some violent accident, so as to be loosened from their unity, do let go the blood out of their cavities. Nevertheless the blood most commonly causing an Hæmoptoe or blood-spitting, proceeds

ceeds from the little mouths of the Arteries being open or torn; and then the fault is wont to be either in the ill temperament of the blood, or ill framing of the vessels. P H A R.
Part. II.

Of either of these there are various kinds and differences, which also concur after a diverse manner to provoke the spitting of blood. For the blood being sometimes more thin and also sharp, it unlocks or corrodes the mouths of the little Arteries; and sometimes again being more thick and prone to coagulate, when it cannot readily enough be received by the Veins, it is extravasated. By reason of these faults in the blood, they who labour with the Scurvy or with a pestilent Feaver, as also those who have drunk some sort of poison, do frequently fall into a spitting of blood. Neither is this distemper less wont to arise from the fault of the vessels, in as much as those being too tender or too thin, many times are burst by a violent motion, as by Coughing, hollowing, leaping, or other vehement exercises; or for that being too loose and moist, their mouths open, and suffer the blood to break out of its circulation: moreover sometimes for that the Veins being contracted and wrinkled by cold, do not readily pass away the blood, but the same restagnating distends the little Arteries, and bursts out of their mouths.

As to the Arteries out of which the blood breaks, causing a spitting of blood, it concerns much of what sort they are, and where they are placed; for besides that there arise notable differences of bloody spittle, according as the blood breaks out from a smaller or a greater vessel; and if either of them be placed in the top of the Lungs near the Larynx, or in the middle region thereof among the greater branches of the vessels, or lastly, in the lower region among the orbicular little bladders: moreover we observe, that the Arteries which use to void blood, are either of the number of them, which arising out of the pulmonary Trunk, do every where accompany the branches of the Trachea; or of those which owning their origine to the Aorta, do cover the coat of the Trachea with a thick branching.

For it is apparent (as we have declared before) from the mouths of these, as also of the Glandules, an unctuous humour sweats out to make the inner superficies of the Trachea slippery: moreover in as much as a serous humour distills abundantly out of the same into the cavity of the rough Artery, a Catarrh arises. Wherefore we doubt not at all to affirm, that even from the mouths of these being open, meer blood sometimes soaking into the Tracheal passages, does propagate a bloody spittle, though in quantity very small. I have observed many, who without a Cough or any indisposition of the Lungs, have once or twice aday voided one or two bloody spittles: which as often as it came upon them, the Patients perceived, either in the bottom of the throat, or on the top of the breast a kind of distillation; whence immediately by the meer contraction of the Tracheal Fibres, with a Snail-like motion, a little of the fluid blood being mixed thoroughly by slegm, and not at all frothy, is voided: and when sometimes that distemper had lasted for many months, no prejudice ensued from thence, which might bring or threaten the Phthisis: which would not have come to pass, if any of the pneumonic Vessels had been opened.

2. So much concerning Vessels voiding blood, and of their divers affections: What belongs to the places wherein the extravasated blood is deposited, these chiefly and almost only are the rough Artery, and the inward cavity the parts thereof. For into this, as into a Jakes, all the filth or superfluities of all the rest of the passages are derived by the utmost endeavors of Nature, as far as possible, to be presently sent out of doors. But if the extravasated blood be thrown into the interspaces of the little Lobes, or soaking out of the outer Membrane, fall into the cavity of the Thorax, it doth propagate an Empyema, and frequently an Imposthume in that place. But for the most part the blood subject to fall from the pulmonary course, produces various kinds of bloody spittle; according as it makes its nest, either upwards within the cavity of the Larynx, or a little beneath about the intermedial passages of the Trachea, or lastly further within the orbicular little bladders. The first distemper proceeds alone from the mouths of some Artery being opened, which covers the trunk of the Trachea; the next sometimes perhaps from this cause, yet more often from the Pneumonic Arteries themselves being open or burst asunder, which vessels as they are greater, pour out often a dreadful quantity of blood; the spitting out whereof proves plentiful and violent, in regard that the muscles of the whole breast, together with the fibres of the Trachea are much provoked and greatly contracted. But if the spring of bloody spittle consists in the lowermost little bladders; the blood is thrown out more sparingly, but with a profound, frequent and very troublesom Cough.

3. And from hence (which was in the third place purposed) the differences of bloody excretion out of the Lungs, and the manifold modes and courses of bloody spittle are made known. For the blood soaking into the Larynx, after a small tickling in

By what fault both of the vessels and of the blood it happens.

What Arteries chiefly and where placed do void blood.

Both the Pneumonic and tracheal are in fault.

Spitting blood from the tracheal Arteries.

2. In what places the blood is deposited.

Either in the Larynx, or in the middle of the Bronchii, or in the orbicular little bladders.

PHAR.
Part. II.

the throat without Coughing or Hawking, doth easily and almost insensibly ascend into the mouth : and if an extravasation of this kind of blood happens in sleep, it presently flows out of the mouth upon wakening, they being scarce sensible of it ; in as much as the moving fibres of the Trachea being contracted while one sleeps, have then emptied the blood fresh distilled into the mouth. But if from a greater vessel gaping or burst about the middle of the Lungs, the blood (which is ever frothy) does break out abundantly into the Tracheal passages, this by an outrageous Cough raised thereby is forthwith cast upwards with violence and in great plenty ; inasmuch that the sick seem rather to vomit than Cough out blood. And finally, if the blood breaking out of the foldings of the vessels wherewith the orbicular little bladders are encompassed, falls down into those little cells, from thence it is discharged by turns in lesser quantity, and not unless by a strong and very frequent Cough.

*The procatartick
and evident
causes thereof.*

So much concerning the formal reason, the conjunct causes and differences of an Hæmoptoe : as to what belongs to the primary and evident causes, either of them are manifold and various. In the former number are reckoned, first an hereditary indisposition of the Lungs, whenas they have originally been weak and soft with a straitness of the breast. Moreover their ill temper from a Cough, Empyema, or Pleurisie going before, and especially an obstruction or ill conformation do very much dispose to spitting blood, and so much the rather, if in such a habit an acrimony or Dyscrasie of the blood shall accrue from an ill course of Diet, unwholesome Air, or by any other means.

The suppression of the Menstrua, the Hæmorrhoids, or blood-flowing from the Nostrils incline most to a spitting blood. Secondly, among the evident causes ought to be reckoned primarily the excess either of heat or cold ; for when the blood grows above measure hot, or the transpiration thereof through the Pores of the skin is hindred ; thereupon swelling after a huge manner, it frequently bursts out of the pneumonick Vessels. From hence Hippocrates long ago observed, and as yet it is a vulgar observation, That spitting blood most frequently happens in a winter when the North-wind blows. Neither less seldom hath the use of bathing brought this evil upon many, before the use whereof they were healthful enough. Moreover many contract this from drinking of wine and strong waters, from a blow, of a fall, hollowing, vomiting, coughing, or any other violent stirring of the whole body or of the Lungs. Also certain poisons, and according to Heurnius the Lunar beams (the reason whereof doth not easily appear, neither doth there remain any credit thereto) are reported to provoke this distemper.

*The Prognosticks
of this disease.*

The Prognosticks of this disease are enough known to the vulgar, whereas there is not any one of them, who doth not suspect the spitting of blood as very dangerous. Nevertheless whereas the kinds hereof are various, one is found more less dangerous than another. The blood soaking out of the vessels of the Trachea is often free from any evil : moreover when breaking out from the lowest and lesser pulmonary Vessels, it often admits of Cure ; at least it is much safer than a plentiful spitting of blood happening from the great branches of the Artery being opened into the Trachea. But the predisposition of the Patient makes a great difference into the Prognosticks of this disease : for if blood-spitting be provoked by reason of a solitary evident cause, and shall happen to a body formerly sound and well set, there appears far greater hope of help, than if the distemper arising of its own accord shall happen to a cachectical, phthical, scorbutic, or otherwise sickly body. However 'tis a common observation, that this disease is dangerous and always difficult to cure : the reason whereof is also clearly manifest, for as much as the function of the Lungs consisting in a perpetual motion, is altogether contrary to the method of healing a wound, whereto primarily ease and rest are required. In like manner this happens to be a greater hindrance to its Cure, in as much as the frame of the Lungs is not a Parenchyma (as was thought) but a texture or very subtil web of innumerable vessels ; the unity whereof if once dissolved, it will be altogether impossible, for the ends of the disjoyned vessels to meet again together, or the space to be filled up with flesh or callous, as in other parts. But there is this only to be hoped, that while the ends of the vessels grow together incongruously and always imperforated, the circulation of the blood ceasing in the part distempered, may be supplied by another neighbouring part : which indeed rarely succeeds without hurt or prejudice of the whole Lungs.

The Cure thereof.

As to what appertains to the Method of healing the Hæmoptoe or spitting blood, the curative indications shall be chiefly these two, viz. to stay presently and restrain the flux of blood ; then secondly, to heal the dissolution of unity without any relicts of a Consumption in the Lungs.

I. Indication.

I. As to the former, these two things are chiefly to be procured, viz. first that blood flow not to the part distempered ; and secondly, that in the mean time the opening of the vessel may be some-how shut.

I. That

1. That the blood may not flow to the part distempered, there are many intentions of healing in use, viz. it will be requisite to diminish the abundance of blood, to restrain the boiling thereof, to alter the intemperament, and depress its motion or divert it another way: for which purposes Phlebotomy, Ligatures, and Frictions are often convenient: also Juleps, Decoctions, Emulsions, and succulent Expressions of Herbs ought to be drunk. Likewise moderate Hypnotics; and in the first place Diacodites are exhibited with success: for these, by restraining the motion of the Heart, do force the blood to cool. P H A R.
Part. II.
1. It stops the
flux of blood.

2. That the opening of the vessel may be shut, astringent and agglutinating remedies are in the first place convenient. The chief of these are used to be exhibited in the form of a Linctus, so that while one swallows, certain particles gliding into the rough Artery, may more immediately communicate their power to the part diseased. But the reason of this operation seems not to be of any great moment; because the efficacy of the Medicines themselves, chiefly and almost only by the conduct of blood reaches to the seat of the disease. Wherefore not only Lohochs, but also Decoctions, Powders, and Pills of vulnerary and balsamic Ingredients are prescribed with success. The forms hereof we shall annex beneath. 2. It shuts the
opening of the
Vessels.

II. The second indication, which is also preservatory, respecting the healing of the dissolution of unity without any remaining hurt of the Lungs, ought to provide against two sorts of evils, viz. lest the spitting blood (whereunto the distempered are afterwards always prone) begin again; and lest a Phthisis succeed, which threatens every body subject to the Hæmoptosis. For these ends for the prevention of this disease daily care and constant course of healing ought to be ministered to the blood and Lungs. II. The second
preservatory in-
dication.

1. As to the blood, the mass thereof ought to be contained ever in a due quantity, and a right temperament, with a mild and equal motion. Hence lest it superabound, or distempered with a Dyrrasie enter into turgescencies, or lodge its impure feculencies in the breast: it is requisite sometimes to use Phlebotomy, and a gentle Purgation. An exact course of Diet is always necessary. Moreover for the depurating and sweetening the blood, drinking of Asses milk, or of Medicinal waters sometimes does greatly help. But Decoctions, distilled Waters, Juices of Herbs, which carry away the ill temperaments of blood, and derive the Serum and other impurities from the Lungs; and bring them forth either by Sweat or Urine, are to be carefully drunk. Besides for this purpose Issues do chiefly conduce. 1. It respects
the blood which
is to be kept in a
right Cras.

2. Neither ought there to be less care of the Lungs themselves, namely that the whole frame thereof, and chiefly the place affected, be preserved in due frame and right tone. Hence every violent motion, whereby its unity is more dissolved, or the restitution thereof hindered, should be industriously declined. Let the party live in a clear and open air, but not too fierce, or sharp; let him abstain from grosser foods; from Noon-sleeps, from plentiful Suppers, and other errors in diet, which induce either repletion or obstruction upon the *Præcordia*. But let remedies be admitted in daily use, which by a peculiar property, or certain specifick vertue are reported to heal the Lungs. 2. A due frame
of the Lungs to
be procured.

The method of healing requisite for spitting of blood, being shadowed after this manner, there yet remains as to all the therapeutic indications, and according to the various intentions of healing which belong to them, for us to subjoyn some more choice forms of Remedies, whose Van those deservedly lead which meeting with the symptom most urging, do suddenly restrain the flux of blood cast out by coughing or otherwise out of the Lungs. In the first rank of these Medicines, those are reckon'd which hinder the blood from flowing to the part affected, and together are impregnate with a certain astringent and agglutinative power whereby the opening of the vessel may be shut, and after the Belly being cleared with a Clyster, and Phlebotomie (unless a weak pulse and defect of heat withstand it) made use of, there is wont to be given somewhat in form of a Julep, Decoction, Emulsion, juicy Expression, Powder, Pills or Lohochs. We will annex certain more elegant and more efficacious Receipts of all of these, as likewise of Narcoticks, which notwithstanding ought not every where and indifferently to be used, but methodically and seasonably, according to advice of a discreet Physician, according to the various constitution of the Patient and condition of the disease. The forms of Me-
dicines.

1. Juleps and Distilled Waters.

Take of Purslain and Poppy-water of each 6 ounces, Dragons-blood in most fine powder half Juleps a dram, syrup of red Poppies two ounces, spirit of Vriol of Mars ℥iij. mix them, the dose ℥iij. repeated once in 5 or 6 hours. Take

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Take of Plantane-water lb. j. Gum Tragacanth and Arabick powder'd, of each ʒss. mingle and dissolve them; after adding syrup of dryed Roses ʒj ss. make a Julep; the Dose ʒij. or ʒiiij. every third or fourth hour.

Distilled Waters.

Take of the water of Oak-buds, red Roses, Water-lillies, of each ʒiiij. of Blood-stone finely ground, Role-Armenick powder'd of each ʒss. syrup of Water-lillies, ʒij. mix them; the dose ʒij. or ʒiiij. three or four times aday.

Take of the Dew or almost inspid Phlegm of Vitriol lb. j. Syr. of Myrtles ʒij. mix them, the dose ʒij. or ʒiiij. often in the day or in the night.

Take of Cypress tops M. viij. of the leaves or flowers of Willow M. vj. the greater Comfrey-roots, Water-lillies, of each lb. ss. Pomegranate flowers M. ij. All being cut small together pour on them lb. viij. of new Milk; let it be distill'd in common Organs, the dose ʒij. or iiij. often in a day.

Take of this distill'd Water, and of Plantane-water, of each lb. ss. Gum Tragacanth and Arabick of each ʒij. dissolve them; the dose is ʒij. every third hour.

The following Mixture is prescribed by Dr. Frederick Decker, to be taken a spoonful at a time in spitting blood, and seems a very beneficial one.

A Julep.

Take of Plantane-water ʒij. Cinamon-water ʒij. conf. of Hyacinth ʒi ss. distill'd Vinegar ʒ, of red Coral prepar'd ʒss. Balaustins, Dragons-blood, of each ʒss. Laudanum Opiae gr. iij. Syr. of Myrtles ʒi ounce, mingle them.

Take of Plantane, red Rose, & Purslain-water, of each 4 ounces of Blood-stone & Dragons blood reduced into fine-powder of each half a dram, Sugar-Candy ʒvj. make a Julep.

A Solution of common Vitriol, or of Vitriol of Mars made in Spring-water, and applied with a rag to a wound, wonderfully stops bleeding, but is scarcely convenient to be given inwardly.

2. Decoctions, Tinctures, and Emulsions.

Apozems.

Take the leaves of Blood-wort, Periwinkle, Mouse-ear, Plantane, Wood-sorrel, both sorts of Daisies, of each one handful, red Rose leaves half a handful, Barly half an ounce, Raisins two ounces, boyl them in three pints of Smith-forge water filtered (or water wherein hot Iron hath been often quencht) to two pints. To the strain'd liquor add two ounces of the syrup of the Juice of St. John's wort, or of Mouse-ear, make an Apozeme, dose from four ounces, to six, three times in a day.

Take the leaves of St. John's Wort, roots & leaves of Tormentil, of the greater Burnet, Meadow-sweet, of each one handful, of the seeds of Purslain, Plantane, Sorrel, of each one dram, Conserve of red Roses half a pound, Spring-water eight pound, boyl them for 12 hours in Balneo Maris, to it being strained add half a scruple of the spirit of Vitriol of Mars, to be taken as the former.

Tinctures.

Take of Barly-water with Madder-Roots boyled in it a pound and half, infuse in it being warm a handful of red Rose-leaves, adding one scruple of spirit of Vitriol, after three hours strain it, adding Syrup of the Juice of St. John's-wort one ounce and half, take three or four ounces, three or four times aday.

Emulsions.

Take of the decoction of the roots of fresh Nettles a pound and a half, white Poppy and Henbane-seeds of each two drams, Melon-seeds 6 drams, make an Emulsion, sweeten it with Sugar of Penids; the dose is three ounces, three or four times in a day.

3. Juices of Herbs and juicy Expressions.

Juices of Herbs.

Take of the Juice of Plantane half a pound, take two or three drams three times aday, in three ounces of the distilled water prescribed before; sweeten it to please.

Take of fresh Nettles, Plantane, the smaller Daisies, of each 3 handfuls, bruise them, and pour upon them of Purslain-water 6 drams, make an expression, take it as the former.

4. Powders and Pills.

Powder.

Take of the powder of Blood-stone, Dragons-blood, ground with Rose-water on a Marble, Pearles, of each one dram, Bole Armenick, and Earth of Lemnos, of each half a dram, Troches of Winter-cherries two drams, make a powder, divide it into twelve parts, one part to be taken three times aday in the former distill'd water.

Take of Henbane, white Poppy-seeds, of each 10 drams, sealed Earth, red Coral, of each 5 drams, Sugar of Roses three ounces, make a powder, the dose one dram morning and evening.

ning; this composition made up with a fit Syrup into a soft consistence, was anciently call'd and PHAR.
renowned in Germany, by the name of Helideus's Electuary. Part. II.

The aforesaid Powders with the addition of Gum Tragacanth dissolv'd, or some fit Syrup, Pills.
may be reduced into Pills or Lozenges.

The spongyous excrescence usually growing to the fruit of Hips or Dog-bryar, reduced into powder, half a dram taken twice aday, is a very profitable remedy in spitting blood.

Take of Tarrow bruised and dried in the Summer-Sun as much as you please, reduce it into powder to be kept in a Glass; the dose from half a dram, to a dram twice aday in any convenient liquor.

Julius Caesar Scaliger's Powder, or rather that of Serapion is mightily commended. Dose four drams twice or thrice aday.

5 Lohochs and Electuaries.

Take conserve of red Roses, of Dog-rose, of each two ounces, powder of white Poppy and Electuaries.
Henbane-seeds, of each two drams, species Diarragacanth. frig. one dram and half, of Blood-stone, Dragons-blood prepared, of each half a dram, Syrup of red Poppies what will suffice to make an Electuary. Take the quantity of a Chestnut evening and morning, at other times let him lick with a liquorish stick.

Take Conserve of the greater Comfry flowers, of Water lillies, of each an ounce and Lohochs.
half, Troches of Winter-cherries, of Diarragacanth. frig. of each a dram and a half, syrup of Jujubes what will suffice to make a soft Electuary, of which lick often.

Take of the white of an Egg well beaten two drams, Sugar of Roses one dram, of white Starch three drams, make a Lohoch to be taken often with a spoon.

Take of Conserve of red Roses 3 ounces, Leucatell's Balsam half an ounce, Troches of Winter-cherries two drams, Syrup of red Poppies what suffices to make a soft Lohoch: the dose is the quantity of a Chestnut night and morning.

II. The second preservatory Indication exhibits such remedies, which by contain- The second Indi-
ing the blood in its right temper, and the Lungs in their due frame, do provide a- cation.
gainst a relapse of spitting blood, and the following of a Phthisis. Such things which
respect the blood, either are mild evacuators by Stool, Urine or Sweat; or are meerly The first inten-
Alteratives. Every of these are usually prescrib'd either in form of Potion, Powder, tion in respect
Electuary, or Pills: We will here shew you the most select patterns of the chief of of the blood.

1. As to Evacuators, a gentle Purgative is sometimes appointed after this man- A Purge.
ner.

Take of the best Senna three drams, Cassia Fistula bruised one ounce, Tamarinds three drams,
Coriander-seeds a dram and a half, boyl them in Spring water to 6 ounces, to it strain'd
add Syrup of Chichory with Rhubarb one ounce, clarify it with the white of an Egg.
Or,

Take four ounces of Gereon's decoction of Senna, Syrup of Apples purging one ounce, mingle
them and make a potion.

2. That the good temper of the blood may be preserved, and the superfluities Alteratives,
drained from the Lungs may be continually discharged by Sweat and Urine, these
following Alteratives, or some of them are for the most part receiv'd into constant use;
which also being endued with a healing power, do succour the weak Lungs, or those
whose Unity is dissolv'd.

For ordinary drink, let simple water, especially in a hot constitution, or being
colour'd with a little Claret-wine, be drunk. Those with whom this doth not agree,
a Bocher of China, Sarsa, with shavings of Ivory, Harts-horn, with white Sanders, or small
Beer, or small Ale, with the leaves of Harts-tongue, Oak of Jerusalem, and the like infused,
are frequently used with good success.

Pectoral Decoctions or Hydromels with temperate Vulneraries are taken twice or
thrice aday to six or seven ounces.

Take of fresh Nettles, Chervil, of each one ounce, Harts-tongue, Speedwell, Mouscar, Decoctions.
Ground-Ivy, St. John's-wort, of each a handfull, boyl them in three pints of Spring-water,
to two pints, adding Raisins stoned an ounce and half, Liquorish two drams, to it strain'd
add

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add Syrup Byzantine two ounces, clarify it with the white of an Egg, make an Apozeme to be taken from 4 ounces to 6, twice or thrice in a day for a month. In a more cold or Phlegmatick constitution, let the Liquorish and Raisins with the Syrup be omitted, add at last of Honey well clarified two ounces, strain it and keep it for use. The Dose is the same.

The use of these is sometimes intermingled with a distilled water appropriate for that use, which likewise is more frequently taken by such who nauseate and loathe Apozemes.

A distilled
water.

Take the tops of Cypress, leaves of Ground-Ivy, of each 6 handfuls, of Snails half boyled one pound and half, of all the Sanders bruised of each one ounce, being cut and bruised infuse them in 8 pound of fresh Milk, distil it in common Organs, the Dose 3 or 4 ounces with a Spoonful of Syrup of Ground-Ivy, to be taken twice in a day.

The second in-
tention respects
the Lungs.

2. In respect of the Lungs, viz. that without obstruction or opening of the vessels, the Union of parts and due conformation of the whole may be preserved, temperate balsamicks chiefly conduce. To this intent *Leucateilus's* Balsam is commonly prescribed to be taken daily and for a long season. Chymists and certain Noble women do cry up with great praise a balsamick Oyl drawn by distillation, called by them the *Mother of Balsam*.

It would be easie here to reckon up very many other remedies against spitting blood very much celebrated by the ancient as well as by modern Writers; notwithstanding the harvest of these already gathered together doth at present seem rich enough. But it remains, that I illustrate as well the Theory of this disease, as the curatory method above delivered, by a History or two of sick Patients.

The first History.

A noble young man, when after a scorbutical *Cachexia* he was affected with a Palsie, and for curing this disease, remedies not only great but improporionate to the blood and spirits were experimented by him, viz. Salivation and the use of Baths, he contracted a spitting of blood, whose fits (of all I ever knew not presently mortal) were most fierce. Presently on the first appearance of this disease, spitting blood followed the Operation of *Hues's* powder (from which having for some time suffered a flowing of the Mouth, without his Palsie being cured he was reduced to great weakness:) Then being afflicted with a Catarrh, and a Cough very troublesome, he began to discharge a discolour'd Spittle, sometimes stained, and sometimes sprinkled with blood; but this disease being mild from the beginning, did suddenly vanish away by the use of remedies, and after going into the Country, and sucking in a more pure air, he became better, and after a while seeming healthful enough in his breast, he went to the Bath for the benefit of his Palsie; where daily bathing for a fortnight in those hot waters, he again contracted a Cough, and a little after an horrid Hæmoptoe or a spitting of blood, so that in the space of 24 hours, coughing often and plentifully, he poured out blood in a vast quantity.

I first visiting him in this condition, provision being made for the whole, I prescribed presently Phlebotomy for revulsions sake: notwithstanding after this administration (both then and ever after) he either repeated the bloody spittle, or grew worse. Moreover, I exhibited Juleps, Lohochs, Decoctions, and also Hypnoticks, which helping little or nothing, ligatures made about his arms and thighs, did first of all restrain the tyranny of this disease: And when afterwards the Evil broke out again, I perswaded him at length, (his drink of Beer being left) that he should constantly drink the decoction of China and Sarsa with the Pectorals. By the continual use hereof, observing moreover an exact course of diet, and altogether abstaining from wine, more hot Aliments, and Salt, and Sugar, for above two years he was well in health.

But afterwards when by being crouded in a Court of Judicature, he grew mighty hot, he relapsed back again into a terrible spitting of blood. A Physician being sent for, he was presently let blood in the arm, whence his spitting of blood became more sharp; and when afterwards letting blood was repeated the second and third day, and the evil grew worse every time, at length Ligatures (as at first) being administered, and the pectoral drink and a Linctus being often taken, the disease presently remitted, and in a short space wholly ceased; notwithstanding he continued the use of his pectoral decoction and slender diet, viz. no flesh-meat, for a fortnight; and from thence he obtained truce from his enemy for three years; and when afterwards at any time the blood swelling by drinking of wine, or taking more dainty food, began to break out from the Lungs, presently by ligatures, and the use of the Decoction and Lohoch, and a thin diet, its assault was wont to be repulsed. But he did not so safely escape, but

that

that it was necessary for him for the most part to keep perpetual watch against that enemy always lurking: for not long since by reason of the intemperature of the year, he contracted a troublesome Catarrh, with a Cough, a plentiful spittle, and sometimes bloody, and then the former Medicines effected less; wherefore, he betook himself by his own advice to new things, and in the first place took evening and morning a spoonful of Syrup of Ground-Ivy, and thereby ensued a notable help: but when the Syrup became quickly loathsome by reason of the Sugar, he took the powder of that herb well prepared half a dram, or one dram twice a day in a spoonful of some liquor; by the long use of which Medicine he was much better as to his Catarrh and Cough. But when the spitting of blood now and then broke out, though in little quantity, he changed again his Medicine, and took twice in a day the powder of the tops, and chiefly of the hairy excrescencies of Cynorrhodon or Dog-brier: which only Medicine a certain Physician renowned formerly for the cure of spitting blood, used with great success. Neither did our Patient receive a less happy effect from that Medicine, for presently after he escaped altogether free from a Cough, a Catarrh and bloody Spittle, and so remained for a long while: until at length believing this disease of the Breast to be wholly subdued, and therefore slighting it, he assumed weapons against the other more ancient enemy the Palsie. Wherefore, while his Hemoptosis or Spitting of Blood was neglected, he daily took a large dose of hot Medicines to conquer that other distemper, viz. magistral waters distilled with Wine, spirit of Harts-horn, of Salt Armoniack, and Aromatick Powders and Confections; Besides, whilst he indulged himself in a more plentiful diet, with a moderate drinking of Ale and Wine, the roaring Lion that at first seem'd to sleep, was again stirr'd up, viz. he had not long continued in that antiparalytical Method, but the Spitting of blood returned with its greatest fierceness, so that in the space of a day and a night he coughed out above three pints of spumous blood. But afterwards a Physician being sent for who presently prescribed Phlebotomy, the spitting of blood began to cease upon bleeding (as formerly it was always wont to do) but then fell into sharp fits again: which however by the use of Ligatures, and a Lohoch and pectoral Decoction daily taken, was presently allwaged, and a while after wholly ceased. And when afterwards he used the pectoral Decoction three months, and a very slender Diet, viz. without any flesh, only of Herbs, Barley, &c. and Milk-meats, in a short time he recovered his former health, and now lives in that state, so triumphing over that cruel disease, that many Hemoptotic persons consult him as their Oracle, and for a Cure do propound a method of this kind of living to be followed before the Physicians advice.

What is most wonderful in this case is, that after so many breaches so often happening in the Lungs, this famous Person was not in the intervals affected with a Cough, neither fell afterwards into a Consumption; whereas most after any of the smallest vessels being open in the *Præcordia*, for some time after labour with a Cough with plentiful and thick spittle, and at length frequently become Consumptive. And that it happened otherwise to our Patient, I chiefly attribute to the balsamick constitution of his blood, viz. in the mass whereof the serous recrements are either less collected, or so strictly mingled, that they cannot be easily separated thence; wherefore after the vessels were broken, or their unity dissolved, a plentiful Ichor or sharp humor (being wont to generate a Cough and spittle) did not sweat out as in many others. Moreover what he himself observed, contrary to many others, that his spitting blood happened never in winter, but in Summer, came also so to pass by the same reason: because when the blood did less abound with vaporous recrements, the opening or obstruction of the Pores were neither an advantage nor prejudice to it; nevertheless the blood growing hotter than it ought to be, seeing it exhaled not, there was a necessity it should break out of the vessels; and when again diminished in quantity, sending away little or no serous Ichor out of the orifices of the vessels, the spitting of blood ceased without a remaining Cough. The same reason holds of many that spit blood, wherefore some are found much inclinable, others not prone to a Consumption. This Gentleman ever found the use of the pectoral Decoction advantageous to him: wherefore when he often varied other Medicines he always retained the same Decoction: moreover he hath commended it to many others spitting blood with success. The form of the Prescription was this.

Take of all the Sanders of each six drams, infuse them for twelve hours in seven pints of A Drink. Spring-water, then boil them to a consumption of a third part, after add leaves of Colts-foot, Maidenhair, Mouse-ear, Speedwel, flowers of St. John's-wort, each two handfuls; sweet Fennel-seeds six drams, Liquorish half an ounce, Raisins stoned half a pound: boil them to four pints, afterwards strain it, and keep it for ordinary drink.

Moreover

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Moreover the spitting of blood threatning and pressing upon him, he took thrice or oftner aday the quantity of a Nutmeg of the following Electuary, drinking after it seven spoonfuls of a Julep.

The Electuary.

Take conserve of red Roses three ounces, conserve of Hips, Comfry, each an ounce and half; Dragons blood a dram, species of Hyacinth two scruples, red Coral a dram, with a sufficient quantity of syrup of red Poppies, mix them and make a soft Electuary: let him take hereof evening and morning a dram and half, drinking after a draught of the following Julep. At other times let him lick it with a Liquorish-stick.

The Julep.

Take Plantane and Spawn-Frog water, each six drams; syrup of Coral, dried Roses, each an ounce; Dragons blood two scruples: mix them, and make a Julep.

Among the examples of them that spit blood the case of that Reverend person Dr. Berwick S.T.P. and lately Dean of St. Pauls Church ought not to be omitted, which some while since I learned partly from the Patient himself, and partly was communicated to me from his Brother that most skilful Physician Dr. Berwick my most dear Friend.

The second History.

That most renowned Divine fifteen years before he died laboured with a most obstinate Cough, and sometimes with a bloody and salt spittle, with a grievous breath stinking like Hell; by which being made lean by a pining away of the body, he wanted but little of being almost extinguished by a Consumption. As often as his spitting blood intermitted, the rankness of breath and spittle ceased also; afterwards the return hereof declared constantly that other affect to be presently attendant. In this languishing condition, when this Renowned man was discovered to favour the Kings Party at that time oppressed with a grievous Tyranny, and being cast into a strait Prison, did drink meer water instead of ordinary drink, he recovered his health beyond the hope and expectation of all persons, and so remained indifferently healthful for above ten years space. Nevertheless afterwards, I know not by what occasion, unless by the hardship of a cold winter, not only the aforesaid evils, viz. a Cough with bloody and salt stinking spittle did become fierce upon him, but also over and above, a debility of stomach, want of appetite, and a nightly Feaver did accrue. But not long after these Symptoms a little remitting, fair weather again seemed to shine out; until on a certain day, the air being suddenly changed into an intense cold, towards night he was assaulted with great straitness of breast and difficult breathing, with a quick and weak pulse, and fainting of all his spirits, as if he had been expiring. Nevertheless from this danger he suddenly escaped by the interposition of a Crisis, viz. by a plentiful spitting of blood, and after by a breathing Sweat: but from that time his spittle remitted much of the usual stench, and something of its saltness; and when in a short time afterwards the last and most painful invasion of spitting blood threatned him, that usual presage from stench of breath was wanting; but the subsequent spitting of blood being very plentiful, did so debilitate his strength, that from that time declining sensibly, he expired within a month: and when a little before his decease, by reason of a sharp pain in his side, a Vein was breathed, his blood seemed to fail so, that almost none streamed out. Moreover in his body dissected after death very little quantity of blood was found: nor could they find any footsteps of the other most notable Symptoms, viz. spitting of blood and of the stinking breath and spittle; for there was no collection of any filth or stinking and putrid matter, nor any cavity in the Lungs made by an Ulcer or Wound; but only one lobe of this bowel, or rather the whole left side was so hardened from a schirrhous Tumor, that the blood could not easily or but very little pass through the frame being so obstructed, and as it were stony: wherefore it is no marvel, if the blood that should have passed most swiftly through the Lungs, did now and then burst out in some place from the vessels, which were joined together, or suffered not a circulation by reason of the Schirrosity.

The reasons of the case.

Notwithstanding here a greater difficulty ariseth, viz. whereas his Lungs were found altogether free from any Ulcer or notable wound, whence that most dire stench of spittle and breath, always a forerunner and companion of the bloody spittle (the last invasion of this disease only excepted) proceeded. We have in another place given remarks upon all these things, as that Ulcers of the Lungs and the purulent spittle of consumptive persons seldom or never stink, but the matter cast out of an Imposthume of the Lungs doth frequently stink: but that in the sick Doctor the Lungs being free from either affect, breathed out so horrible a breath, the reason will best of all appear, if we inquire of the manner and cause of a stench in general. For we observe this to be excited when the impure Sulphur is dissolved either by a lixivial, or an acid Salt, and is precipitated by the other. Let common Sulphur, or Sulphur of Antimony be dissolved by Oil of Tartar or Stygian water; afterwards if you pour on this solution a dissolution

lution of fixed Salt, and upon that, Vinegar, a most hideous stench will arise. In like manner we may conceive in the case proposed, that the sulphureous particles of the blood being very impure, were corroded by the fixt Salt, with which its juice abounded very much; afterwards when the acid humor, having endured a flux, reflows from the nervous parts into the mass of blood, it precipitates the dissolved Sulphur, and so causes that stench to be exhaled from the Lungs, and whilst it forces the blood into a turgency, a little after it compells to a spitting of blood. I have known some endued with a breast firm enough, and free from all Coughs, and consumptive disposition, who have for the most part breathed out a most hideous stench: which could proceed from no other cause, besides what even now we have observed. The impure blood abounding with Sulphur dissolved with Salts, if perhaps while it is rarified within the Lungs, and loosened in its frame, it meets with an acid humor, it will exhale in breathing putrid and horrid effluvia's. It happens by the like reason of the blood otherwise disposed, that as the breath of some persons is very stinking, so of others very sweet. And indeed the breath or air reciprocated through Respiration, for that it carries out with it the effluvia's of blood highly rarified within the *Præcordia*, one while disperses a grateful vapor, another while a most unpleasant.

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SECT. I. CHAP. VIII.

Of a Peripneumony, or Inflammation of the Lungs.

A Peripneumony is usually defined to be, An Inflammation of the Lungs with an acute Fever, a Cough, and difficult breathing. They who labour with this distemper are greatly sensible of a notable inflammation in their breast with a swelling of the Lungs, and sometimes a pricking pain, they draw a painful and short breath, or as *Hippocrates* affirm, a deep breath; the Fever presses with great thirst, watching, and painful Cough; whereto also bloody spittle, or streakt with blood, succeeds. By which Symptoms it clearly appears, that this disease arises, in as much as the blood boiling feverishly, doth not easily pass through the lesser pneumonic Vessels; but sticking, in their passages, begets first an obstruction, afterwards being more heaped and extravasated, propagates a Phlegmon or Inflammation with heat, a Cough, and discoloured spittle. Moreover in as much as the blood so accumulated and stagnating, puffs up these passages of the Lungs, and compresses them, a difficulty of breathing is caused; and in as much as it pulls or distends the nervous Fibres, a pain frequently arises.

The description
of a Peripneumony.

But if it be asked, how a Phlegmon should grow together in the frame of a Lung merely bladdery and excarnous; and after what manner it is distinguished from that distemper which is wont to be stirred up in muscous flesh, or the substance of a bowel? We must answer, although the above-mentioned parts vary as to the texture, notwithstanding the reason of the affect is altogether the same in each of them. For the small sanguiferous vessels do every where alike embrace, bind, and variously gird about both all the Tracheal passages in the Lungs, and also the fleshy fibres in the Muscles, and lastly the little fibres and nervous threads, with the thickest foldings, like clusters, of the Parenchyma. But that which produces a Phlegmon is the blood itself, which, while it grows very hot, and is hindered in its passage, every where, and especially in the Lungs, whose vessels branch into very small foldings, doth first beget an obstruction, and then an inflammation.

After what
manner a Phlegmon is bred in the Lungs.

Wherefore the formal reason and conjunct cause of a Peripneumony consists in these two things *viz.* that the blood boils feverishly, and sticking also within the more narrow passages of the Lungs, engenders there an obstruction causing inflammation. Unless these two things concur, there is an exemption from this disease; for in many other Fevers, especially in a burning Ague, though the blood, most intently, heated and inflaming all the *Præcordia*, as also in the longing of women, the Green-sickness and the Dropsie of the breast, is very clammy, yet though sticking very much in the passages of the Lungs, it does not stir up a Peripneumony: to produce which both distempers must concur and joyn their strength. Nevertheless when there is an indisposition of both these, one while this, another while that, is first in act, and after a sort one is the cause, or at least the occasion of the other. For sometimes the blood irritated into a Fever causes an obstruction of the Lungs; and the blood also sometimes finding a remora in the Lungs, receives a feverish boiling from its proper obstruction. Not-

The conjunct cause
of a Peripneumony consists in two things:
1. That the blood boils.
2. That it sticks in the passages. Sometimes this disposition sometimes that is first.

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What that is
Phlebotomy dis-
covers.

withstanding, for the constituting the procatactic cause of this disease, the blood ought to be fitted as well for the boiling, as for the obstructing the vessels of the Lungs. Tho it will not be easie to shew what this disposition of the bloody liquor is inclining to a Peripneumony, yet the reason thereof doth something appear by Phlebotomy, always made use of in this disease with the best success. For the blood being drawn from any labouring with this disease, as also from those in a Pleurisie, after it grows cold in its superficies, instead of a Scarlet cream, it hath a little film somewhat white or otherwise discoloured growing on it, which also is very tough and viscous: whence we may conjecture, that the mass of blood being too strait in its frame, whilst that in the circulation it doth not discharge its recrements, grows too thick, and as it were clammy, and for that cause becomes too prone as well to boil as to stick within the narrow passages, and especially of the Lungs.

What affection
of the blood pro-
duces it.

But if farther inquisition be made, from whence this disposition of blood proceeds, by which it becomes clammy and viscous like ropy wine; the general reason hereof is this, viz. that the more thick parts of blood are not made thin enough by the more subtile; so that all of them being equally mixed and mutually incorporated, at length the good humors separate themselves into their appropriate functions, and the superfluous are perpetually discharged by their proper Emunctories. But on the other side in as much as the sulphureous particles of the blood being combined together with the saline and earthly too much exalted, ensnare and entangle all the rest; for that cause its liquor containing within it self all its recrements and impurities, grows clammy as glue, and in that regard contracts an inflammable disposition.

For it is obvious to every person, that the blood that grows clammy in this manner, is rendred prone to obstruct the narrow passages of the vessels (which surely are very small in the Lungs); moreover for the same reason they are disposed to become feaverish: viz. because retaining obstinately within its own bosom all the feculencies and recrements, from the same presently gathered into a heap, it is constrained into a great turgescence or swelling, whereby of necessity an inflaming obstruction of the Lungs takes either its origine or augmentation.

The fault of the
Lungs produces
it.

Moreover as to the procatactic cause of this disease very frequently the faultiness of the Lungs is joined herewith, and determines that general intemperament of blood to affect this part in such a sort. For as the clammy blood grows hot, the more strong and sound *Præcordia* do frequently discharge the designed mischief from themselves, and the taint being fixed to the Pleura, or about the habit of the body, a Pleurisie or Rheumatism is rather caused than a Peripneumony. Nevertheless the tender Lungs being obnoxious to a Cough, or formerly prejudiced in their frame either by spitting blood, or other distempers of the breast, from the blood boiling up (while it is too much bound and clammy in its own consistence) they easily engender an obstructing Phlegmon.

The evident cau-
ses of a Peripneu-
mony.

Hitherto of the conjunct and procatactic causes of a Peripneumony: as for what regards the evident causes, whatsoever suddenly perverts the temperament of the blood, or restrains its free transpiration, ought to be referred hither, as chiefly are excesses of heat and cold, or the inordinate drinking of Wine or strong Waters, any vehement exercise, and the drinking of some waters, and those especially icy. Besides, sometimes a malignant distemperature of Air doth engender this disease in many, and makes it Epidemical.

It often succeeds
or follows after
a Pleurisie.

Authors in Physick do every where observe (and it is also a vulgar observation) a Peripneumony frequently succeeds or comes upon a Pleurisie; but nothing is more usual than in a Pleurisie a bloody and thick-spittle, and as it were purulent to be voided. Hence a great disquisition arises, by what passage or ways the matter by spittle cast out, can be conveyed from the Pleura to the Tracheal passages. Some think, that this being fallen into the cavity of the *Thorax*, is sucked into the Lungs as with a Sponge; and others suppose, that it is transferred thither by the Membranes adhering thereto, by which the Lungs often stick unto the Pleura. But truly either way seems improbable if not impossible. For first, that the Lungs do not suck in the contents of the hollownes of the Chest is manifest from hence, because in a Dropsie or wound of the breast, when they happen, the Lungs being unhurt, neither water nor blood is at all discharged by coughing; though frequently great plenty of this or that humor be there, which presently flows out of its own accord from the *Thorax*, incision being made. But that sometimes the Membranes growing from the Lungs, knit themselves to the Pleura, is clearly manifest by Anatomical Observation; yea and by this way of return I have sometimes known the purulent matter translated into the side, and there by an Issue, made by Art or Nature, to have been evacuated with a healthful Crisis: nevertheless such Membranes of the Lungs joined to the Pleura do seldom pre-exist, and in a Pleurisie, which is a very acute disease, they cannot, like a Mushroom, be the issue of one or

two days: moreover, though sometimes those obscure passages may be ready at hand, which perhaps by some admirable instinct of Nature discharge something out of the Lungs towards the precincts of the *Thorax*; yet it seems against the Oeconomy of Nature, that they can derive any corruption outwardly engendered to this most noble part within, which surely is the fountain both of life and heat.

As to this, if it may be lawful to propound our Judgment, I am induced to think that a Peripneumony and Pleurisie are one while singular and separate affects, and another while bred together and coexisting from the first, and another while are by course one after another or succedaneous. For the procuring cause being stirred up into act, so that the blood growing clammy, and boiling together, obstructs in some places the lesser vessels: the nest of the disease sometimes is fastned on the Pleura, or seperately in the Lungs, sometimes in each of them together, and sometimes first in one, and then in t'other: but for the most part, the Pleura being first healed, presently the same morbidic cause invades also the Pneumonic Vessels. Moreover we have known a various shifting of this effect; viz. that it has first troubled the right or left side, presently that being deserted, to have occupied the Lungs, and afterwards both being deserted, to affect the Brain, and frequently to transfer its seat from thence into the above-mentioned places. But for the reason aforesaid a Peripneumony not only succeeds a Pleurisie, but frequently a Squinancy, and sometimes other distempers: for while the Blood growing clammy, and boiling together, continues a Feaver in the whole, it transfers the obstruction causing a Phlegmon variously hither and thither. And from hence the solution of that observation is clearly manifest, which has so much puzzled Interpreters, viz. that a Palsie or dead Palsie of one side doth sometimes succeed a Peripneumony, because the blood that being clammy, had lately obstructed the Pneumonic Vessels, afterwards stuffing certain foldings of the vessels of the Carotides, prohibits the engendring of animal spirits in this or that part of the head, and so restrains their influence into the respective nervous parts. From what hath been said, the chief differences of a Peripneumony are made plain, namely that it is either a simple distemper, or joined together with a Pleurisie, Squinancy, or some other, and then it is either primary or secondary. Moreover it is usually distinguished as to the Feaver and state of breathing: to wit, according as this is more or less prejudiced, and as it shall be more intense or remiss, this disease also is denominated either more or less acute.

The reason of this is inquired inio:

The differences of this disease:

As to the Prognostics of this disease, common experience doth attest, that it is a very dangerous disease, because many Patients either die of it, or very difficultly recover health. No less may we conclude this from the reason or Etymology of it; for a wound with much extravasation of blood, or a stagnation caused in the Lungs, is most difficulty cured, and the affected place is never restored unto its former conformation. The Prognostic signs, which are of greatest note, are taken from the appearance of Symptoms and nature of things thrown out, and the State of strength.

Prognostics:

1. A Peripneumony coming upon a Pleurisie or Quinzy, for the most part is worse than arising of it self, or succeeding either of them: but if upon this disease, after what manner soever begun, an acute Feaver follows with great thirst, watchings, and not breathing unless set upright, it is ill; and yet much worse, if upon it a Delirium, a Frenzy, convulsive motions, or a Palsie on one side ensue. Moreover the Patient is not in less danger, if he be very pursie, if troubled with vomiting, or frequent swoounding away, a weak Pulse, and a cold sweat. For while these Symptoms are instant upon him, the obstruction of the blood in the Lungs is not removed, nothing is digested or ejected by spittle; but circulation of the blood being more and more hindered, and its kindling by breathing stopt, the animal spirits are thoroughly disordered, and at length faint, until together with a prostration of the whole strength the vital flame is extinguished.

1. From the appearance of Symptoms.

2. As to Prognostics from things excerned, we observe Peripneumony to be dangerous, wherein nothing is thrown out by spittle; next to this, when the spittle is thin and crude, mixed with blood; it is far better when the spitting is yellow and thick, streaked with a little blood. The Urine being yellow from the beginning, and of a good consistency, with a cloud in the midst shews that almost all the recrements of the blood are lodged in the place affected; when from that state it is changed into a thick and turbid Urine, it shews the morbidic matter to be swallowed up again from that part into the blood; but if such kind of Urine be suddenly changed into a thin one, then a Delirium or death it self is impendent. Much Sweat and plenty of Urine, a Diarrhoea, bleeding at Nose, flowing of the Menstrua's, or the Hæmorrhoids do frequently promise good in this distemper, yea any of these Evacuations happening seasonably doth frequently discharge the disease.

2. From what is excreted.

P H A R.
Part. II.3. From the
state of strength.The Cure hath
two chief indi-
cations.The first indica-
tion suggests
four intentions
of curing.1. The first in-
tention that the
afflux of blood
may be cut off.
2. That the ex-
travasated be
reduced to cir-
culation.Rules concerning
Phlebotomy.The third inten-
tion of healing
is that the clam-
miness or visco-
sity of the blood
may be taken a-
way.

3. The condition of strength is ever of great moment in forming a due Prognostic in this disease: for oftentimes when horrid Symptoms, as an intense Fever, a Breathing very painful, with a Cough, watchings, and other ominous signs, shall be pressing, if the Pulse be as yet strong, and the animal spirits persist in their vigor, there is better hope of the Patient, than if these things being more quiet, there were a weak Pulse, and the Spirits should become drowsie and oppressed.

The first indication about the curatory Method in a Peripneumony is, that the blood being impacted in the pneumonic Vessels, and causing a Phlegmonous obstruction, may be from thence discluded and restored to its pristine circulation. Which if not to be procured, the second indication will be, that that matter be dully digested or brought to suppuration, and with all expedition voided by spittle.

While the former indication prevails, the intentions of healing will be these ensuing. First, that the more plentiful afflux of blood to the part affected be prevented, or prohibited, by some means. Secondly, we must endeavour, that the matter stagnated or extravasated in the Lungs, be swallowed again by the Veins into the rest of the mass, and caused to circulate. Which that it may be the better procured, thirdly, the blood ought to be freed from its clammy viscosities, whereby its fluidity is impeded. Fourthly, that we apply to the Symptoms most urgent, viz. a Fever, Cough, Watchings, and difficult Breathing, fit Remedies. But if notwithstanding all these another indication shall come into use; it will be requisite to prescribe maturating and expectorating Medecines vulgarly so called, together with these.

1. That we may satisfy the first and second intention together, Phlebotomy is for the most part requisite in every Peripneumony, yea sometimes it ought to be more frequently repeated; for the vessels being emptied of blood do not only withdraw the nourishment of the disease, but do also sup up the matter impacted in the place affected. Wherefore if strength remain, and the Pulse be strong enough, a more free breathing of a Vein is convenient at the very beginning; but otherwise let it be used in a little quantity, which however may be repeated as occasion offers it self. We intimated above, that blood drawn in a Peripneumony and also in a Pleurisie, after it is cold, contains in its superficies a small viscous and discoloured film: moreover we may observe one while the blood entirely, another while only a portion thereof is subject to this change. For when the blood is received into three or four dishes, sometimes in all, but oftener in the second and third dish it is apparently bad, and in the first and last laudable enough: wherefore they commonly give it in precept, that blood is always so long to be emitted, till that which is so depraved begins to come forth; and if strength remain, the bleeding should continue till the good blood flows out again. Truly as common experience doth approve of this practice, even so doth reason it self; for in this disease, because the whole mass of blood doth not presently acquire that clamminess, the depraved portions are chiefly accumulated about the place of obstruction, and adhere on every side in the lesser vessels. Wherefore the blood first issuing by Phlebotomy is often void of any fault; afterwards the vessels being emptied receive the other morbid matter at first stagnated, and restored it to its circulation; and when the portions thereof being placed near, are carried as it were in a joint troop, they flow out together at the orifice of the opened Vein, and after that entire mass of bad blood hath flowed out, the residue being more pure doth succeed. Wherefore in this case ever let incision be made with a large orifice, and let the blood be drawn out not only with a more plentiful spouting, but also with a continued: for otherwise if in the midst of Phlebotomy, the bad blood issuing out, the orifice (as the manner of some is, lest the spirits should faint) be closed with the finger, when again it is opened, the blood pure enough will issue next, but the bad sliding by, if there be any remaining, will not return presently to that orifice. Besides Phlebotomy many other remedies, viz. whatsoever do repress the turgency of Blood, and empty the passages thereof, whereby the morbid matter may be sucked up, are here to be used. Wherefore a very thin diet is prescribed for the most part merely of Barley and Oats: and if Cathartics are altogether prohibited, because they disquiet the Blood, and hurry it more impetuously into the part affected; notwithstanding Clysters which gently loosen the Belly, and draw the recrements of the blood towards the Belly, ought to be daily used. Moreover Ju- leps and temperating Apozems which bridle the fervour of the blood, and draw out the superfluous serosities thereof, and which also do gently open the passages of the

Breast, are taken with success

3. The third intension of healing, which respects the withdrawing of the clamminess or obstructing viscosity of the blood, is altogether to be performed by remedies which unloose the frame thereof being too much bound, and dissolve the coupling together of its salts. And truly the remedies of this kind, which in this respect reason and

analogy

analogy would dictate, are now received into use by long experience. For Powders of Shell-fish, the Tooth of a Boar, and the Jaws of a Pike, and other things endued with an Alkali Salt, also Sal Prunellæ, for the most part are prescribed by all Practitioners, as well modern as ancient. I have more frequently known the Spirit of Salt Armoniac and of Harts-horn to have yielded notable relief in this disease: and for the same reason it is; (*viz.* because the volatile Salt is useful) that the infusion of Horse-dung, though a common remedy, affords oftentimes singular help.

4. As to the Symptoms and their Cure, very many remedies appropriated to these fall in together with the former; for against the Fever the same Julips and Apozems which appease the heat of blood, and withal recreate the animal spirits are of most common use: to which besides in respect of the Cough and difficult breathing, temperate pectoral Remedies are added. The great difficulty is what ought to be exhibited against want of sleep, when it shall grievously oppress; for Opiates, because they do further prejudice the breathing, which in this disease is already hindred, are scarce safely administered, nay sometimes become mortal. Wherefore Laudanum and the strong Preparations of Opium are to be shun'd in a Peripneumony worse than a Dog or a Snake; nevertheless Anodynes sometimes, and mild Hypnotics, as water and Syrup of red Poppies, are not only allowed, but accounted specific remedies in this disease and in a Pleurisy: but sometimes it will be expedient to use Diacodiates as long as strength endures, and as long as the Pulse is strong and good enough. For the pain of the breast if at any time it be troublesome, it is expedient sometimes to apply Liniments, Fomentations, and Cataplasms.

4. That the most urging Symptoms may be helpt.

The second curative indication whose intentions are to digest the matter impacted in the Lungs (if it cannot be dissolved or sucked up) and to throw it out by spittle, requires ordinary maturating and expectorating Medicines, both which notwithstanding ought to be temperate, that is to say, such as allwage thirst, and appease the feverish heat rather than exasperate it. We have above recited in the Chapter of a Cough the kinds of these sorts of Remedies properly called Pectorals; the more select Receipts and chiefly accommodated to this affect, shall be annexed here beneath.

The second indication respects the maturating and expectoration of the morbid matter.

The Forms of Remedies.

1, 2. The Medicines conducing to the first and second intention are prescribed according to the following Forms,

Take the water of *Carduus Maria* ten ounces, red Poppies three ounces, Syrup of the same an ounce, Pearls prepared a dram, make a Julep: the dose six spoonfuls every fourth hour.

Juleps.

Take water of black Cherries, *Carduus Benedictus*, Balm, each four ounces; powder of a Boars tooth a dram, Syrup of Violets ten drams: make it into a Julep to be taken after the same manner.

Take Grass-roots three ounces, shavings of Ivory and Harts-horn each three drams, Raisins stoned an ounce and half, Liquorish two drams, boil them in Spring-water from three pints to two, to the strained liquor add Syrup of Violets an ounce, Sal prunella a dram: make an Apozem to be taken thrice a day about three or four ounces.

Apozemes.

For the same intention, *viz.* that the Vessels being emptied may withdraw the nourishment from the disease, or sup up the morbid matter, a Purge is prescribed by many. In the Practice of the Ancients against this disease, even as against many others, after Phlebotomy, Preparatives and Purgatives were usually appointed in a constant course, and of late the Chymists with greater boldness do recommend Vomits, and in a Peripneumony prefer it to all other remedies. Yea Phlebotomy being omitted or countermanded, they place the chief Cure in stibiatic Vomits: than which rash advice of theirs I know not any thing may be thought of more pernicious. Indeed in rustic and robust bodies sometimes this Cure has been effected without danger, notwithstanding for the most part no less unsuccessful; but in tender constitutions it ought to be reckoned little inferior to poison. But for what respects Purgation, although it may not be presently convenient from the beginning, because it is then for the most part prejudicial, nevertheless the flowing of the morbid matter being finished, and the effervescency of blood being appeased, we may safely and gently evacuate the body with a loosning Purge.

Purgation.

Take of the decoction of Senna of Cereon four ounces, Syrup of Roses solutive an ounce: mix them for a Potion, Or,

Purgers.

Take the best Senna three drams, Cassia and Tamarinds each half an ounce, Coriander-seed two drams: boil them in a sufficient quantity of Spring-water to six ounces, to which strained add Syrup of Violets an ounce, clarified with the white of an Egg, and let it be given.

Purgative

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Clysters.

Purgatives are not always to be exhibited, nor ever unadvisedly in this disease: but frequent Clysters, and almost daily are in use; but let them be gentle and emollient only, which easily loosen the belly, without any great agitation of humours or blood. For this purpose Milk or the Whey thereof is often convenient, with red Sugar, or Syrup of Violets: Or, Take the leaves of either sort of Mallows, of Melilot, of Mercury, of each one handful, Linseed and sweet Fennel-seeds, of each half an ounce, sweet Prunes, numb. vi. boyl them in a sufficient quantity of Spring-water to a pint, to which add Syrup of Violets one ounce, Sugar ten drams, sal Prunella one dram, make a Clyster.

**Things dissolv-
ing the clam-
miness of the
blood.**

3. Medicines for the third intention, viz. for the dissolving the Clamminess of the Blood, are wont to be administered in form of a Powder, of a Spirit, a Potion, or of a Bolus, according to the manner following.

1. Powders.

Powders.

Take of Crabs eyes two drams, sal Prunella one dram and half, pearl'd Sugar one dram, make a powder for 6 doses, one to be taken every sixth hour, with a proper Julep or Apozeme. Or,

Take of the Tusk of a Boar, (or the Jaw of a Pike) of Crabs-eyes, of each one dram and half, flowers of Salt Armoniack, Powder of red Poppy Flowers, of each half a dram, mix them for 4 doses.

2. Spirits and Chymical Liquors.

Spirits.

Take of spirit of salt Armoniack distill'd with Olibanum, 3 drams; the dose from 12 drops to 15 or 20, three times in a day. Or,

Take Spirit of Urine or Soote, after the same manner, three drams.

Take of the sweet Spirit of Nitre, (viz. often cohobated with Spirit of Wine,) 3 drams, the dose from 6 drops to ten after the same manner.

Take half an ounce of Spirit of Tartar, dose 15 drops to 20 or 25, in a fit vehicle.

Take of the simple mixture one ounce: the dose is one scruple to half a dram, after the same manner.

3. Potions.

Potions.

Take of Cardus-water one pound, fresh Horse-dung 3 ounces, dissolve it warm, and filtre it; the dose is 3 or 4 ounces, twice or thrice in a day, with half an ounce of Syrup of Violets or red Poppyes.

Take of the Leaves of Dandelyon two handfuls, bruised and infused in half a pound of Cardus Maria water, Treacle-water half an ounce, press it out, and add powder of Crabs-eyes one dram: take 4 or 6 spoonfuls three times aday.

**The cure of the
Symptomes.**

The fourth intention of Healing in respect of the symptomes greatly urging, doth suggest divers sorts of preparations of Medicines. 1. In respect of the Fever, the Juleps and Apozemes above recited are convenient. Moreover, the use of Mineral Crystal ought to be frequent. 2. For the Cough and difficult Breathings, Linctus's, Eclegma's, and Decoctions, or pectoral Juleps are administered with success.

Linctus's.

Take of Syrup of Jujubes, of Maiden-hair, of each one ounce and half, of Violets one ounce, flower of Nitre one scruple; make a Linctus to be lickt now and then.

Take of Syrup of Marsh-mallows one ounce, Diacodium, red Poppyes, each half an ounce, powder of Crabs-eyes two scruples; make a Lohoch, to be taken the same way.

Lohochs.

Take Syrup of Hyssop, of Liquorish, of each one ounce and half, red Poppy-flowers powder'd, one scruple, Crabs-eyes one dram, Lohoch de Pino 6 drams, make a Lohoch, take the quantity of a Nutmeg four times or oftner in a day.

An Apozeme.

Take the roots of Grass, Chervil, Marsh-mallows, of each one ounce, Figs numb. 4. Jujubes and Sebestens, of each numb. 6, Raisins one ounce, Liquorish three drams, Barly half an ounce, boyl them in three pints of Spring-water to two, strain it; the Dose three or four ounces.

Take Raisins stoned one ounce and half, Filberds numb. 4. cut, Liquorish sliced 3 drams, of Hyssop-water a pound and half, infuse them warm in a closed Vessel 6 hours, strain, and add Syrup of Marsh-mallows an ounce and half, make a Julep, the dose is 3 or 4 spoonfuls often in a day, swallowing it by degrees.

3ly, Against Watchings, Take Poppy-water 3 ounces, Syrup of red Poppies 6 drams, Aq. P. H. A. R. Epidemica 2 drams, for a draught, to be taken at night. Part. II.

If the Pulse be strong, and the strength agreeable, Take Cowslip-water 3 ounces, Syrup Against Watch-
de Meconio half an ounce, for a draught at night. ing.

4. If the pain be troublesome about the place affected, Take Oynment of Marsh-mal- For pain.
lows two ounces, Oyl of sweet Almonds an ounce and half, mingle them for a Liniment to be ap-
plied with thin Lawn-paper.

Take of Oynment of Marsh-mallows and pectoral Oynment, of each an ounce and half,
Linseed Oyl fresh drawn one dram, to which add the Plaister call'd Emp. de Mucilaginis;
make a Plaister for the Region of the breast, to be applyed on the place affected.

Fifthly, For the last intention of curing which answers to the secondary Indication,
and prescribes Medicines ripening and expectorating, the following forms are conve-
nient.

Take Linseed Oyl fresh drawn three ounces, Syrup of Violets two ounces, Hyssop-water Maturating
half a pound, mix them in a Glass, take two or three ounces three times in a day, shaking medicines.
the Glass first.

Take powder of Olibanum one dram, put it into an Apple made hollow, and roast it in hot
Embers, let him eat it at night, repeating it three or four times.

Take Oyl of Almonds fresh drawn, Syrup of Maiden-hair, of each an ounce and half, Expectorating
Sugar-Candy two drams, stir them well in a Glass-mortar until they are perfectly mixt, Medicines.
make a Linctus to be taken often in a day with a Liquorish stick; also let a spoonful be ta-
ken three times a day in a draught of Posset-drink.

As to the rest, Remedies prescribed against a beginning Consumption do also pro-
fit in this case.

It would be easie to heap up here many Histories and Instances of Patients affected
with a Peripneumonie; but whereas the same order and figure of the disease, and the
same reasons of the Symptoms are almost in all, it suffices here to note one or two Ex-
amples only. And while I was writing these things I am sent for to a Patient grievous-
ly sick with a Peripneumonie. He was aged about Fifty years, lean in body, and of a
choleric temper, by taking cold he fell into a Feaver, with a Cough, with pain of
the Breast, and difficult breathing: when he had laboured thus four dayes without
any remedy or physical administration, I found him in a notable Feaver, with thirst,
and a huge inflammation of the Precordia, breathing very difficultly, with labour of
the Thorax, and painfully, with a noise of the Bronchia, insomuch that he seemed
evidently in the very Agony of death. His Pulse being strong enough (although quick
and disturbed) I immediately prescribed Phlebotomy, to eight or ten ounces, by which
when he received a little relief, after three hours intermission, a Clyster being first ad-
ministr'd, I ordered him to repeat his bleeding to twelve ounces: Moreover, I or-
dered Spirit of Harts-horn to be given twelve drops every sixth hour, with an appro-
priate Julep, and in the distance between I ordered a dose of the following Powder to
be administr'd:

Take powder of Crabs-eyes, sal Prunella, of each one dram and half, Pearls a dram, Su-
gar-Candy two scruples; make a powder to be divided into 8 doses.

Moreover, he took as often as he pleased a draught of a pectoral Apozeme. By the
use of these within three hours all the symptoms began to abate, and the night follow-
ing he sweat, and slept a little; the day after I repeated Phlebotomy, and after conti-
nuing the same Remedies in four or five days he intirely recovered his health. The
blood we took from him was always in the Superficies viscous and discoloured.

A certain Gentleman of a sanguine Complexion and a strong habit of body, after an
immoderate drinking of Wine contracted a Feaver, with a most painful Peripneumo- The second Hi-
nie, insomuch that thirst and heat mightily pressing him, sitting always upright in his story.
Bed or Chair, and breathing short and very frequent, he could scarcely, yea almost not
at all suck in air enough to sustain the vital flame. Because he could not undergoe a
large Phlebotomy, I drew blood twice or thrice day after day; frequent Clysters were
administr'd: Moreover, Apozems, Juleps, also Spirit of Armonack, and powder of
Fish-shells

P H A R.
Part. II.

Fish-shells were administred by turns. Within four or five days the Feaver somewhat abated, also he began to breathe better, and sometimes to take short sleeps, yet he did always complain of a notable heaviness of his breast, and intolerable oppression of the Lungs; wherefore, when Phlebotomy was no longer safe, I applyed very large Veficatories to his Arms and Thighs, the blisters in his arms dry'd up in a short space, but those on his legs did not only remain open, but after five or six days did run hugely, and afterwards almost for a month daily discharged great plenty of a most sharp Ichor; in the mean time his lungs sensibly amended, and at length were delivered from all their burden; lastly, the little sores raised by the Veficatories very painfully and not without frequent Medicines could be cured.

SECT. I. CHAP. IX.

Of a Pleurisie.

*The diseases of
a Pleurisie and
Peripneumonie
are akin.*

*How they differ
betwixt them-
selves.*

*The seat of a
Pleurisie.*

*The next cause
of it.*

HOW great affinity there is between a Pleurisie and Peripneumonie, we have hinted before; viz. although either distemper is sometimes solitary, and exists separately from the other, yet they often happen together, or one while this, another while that, come one upon the other, or succeeds it. The foregoing cause is the same of both, viz. a disposition of the blood to be clammy and boyl up withall; also, the conjunct cause is the same, viz. an obstructing Phlegmon in some part of the lesser Vessels, by reason of such a disposition of blood. Moreover, the same method of Cure is prescribed by most modern Physicians for either disease: The chief reason of the difference whereby they are distinguished one from the other, is taken from the places affected, which their Names denote. For the blood predisposed to the enkindling in some place an inflaming obstruction, therefore often plants the nest of the disease in the breast, because here it burns out more hideously, by reason of the Hearth of vital fire; and also is not freed from the vaporous Effluvia and other Recrements which hinder Circulation. To all which there ensues, that in this Region, the mass of blood being shut up, and not able to pass through the more strait Conveyances; is not as in the bowels of the lower Belly, opened with any ferment, or new washt with any watery juice: wherefore, if perhaps the blood, carried through the vertebral Arteries into the membrane encompassing the ribs, shall stick in its passage, about the narrowness of the Vessels or inter-spaces, the Distemper of which we now treat succeeds: In like manner, if an obstruction happen within the passages of the Lungs, a Peripneumonie, will ensue, as we have declared before. Wherefore, according to the Pathologie of this disease before delivered, those things which belong to the Theory of a Pleurisie, as well as the Curatory method, may with small labour be designed.

Both the sense of pain, as well as Anatomical Observations taken from the Patients dead of a Pleurisie do plainly attest, the seat of this Disease (as often as it exists primarily and solitarily) consists in the Pleura or Membrane environing the inside of the ribs. And a true and singular Pleurisie is an inflammation of the Pleura it self, from the abundant flowing in of inflamed blood, growing clammy withall, taking its motion through the vertebral Arteries, with a continual and acute Feaver, a pricking pain of the side, a Cough and difficulty of breathing.

The next Cause is the blood obstructed by reason of its clamminess in the lesser vessels and interspaces of that membrane (in like manner as it is in a Peripneumonie) or being extravasated, being heaped in the same place more plentifully, by reason of the swelling up, for that cause exciting an inflammation. An acute pain ariseth upon this, by a wound in a part highly sensible; also there ariseth a Cough by reason of a provocation giving impression to the intercostal muscles; moreover a difficult breathing by reason of the muscular fibres being hurt as to their action; which because they cannot perform long and strong contractions, they are constrained to undergo weak although more frequent Contractions, otherwise than in a Peripneumonie, in which that symptom ariseth from a Lung too much fill'd and stuffed. The Feaver is caus'd from effervescence of blood, and is for the most part rather the associate than the effect of a Pleurisie. For the blood from what cause soever driven into a feaverish turgescency, if it be bound up together in its mass, will be apt to grow clammy, which together with the Feaver most often induces a Pleurisie or a Peripneumonie, or both of

of them. From hence we may observe this disease doth frequently vary its kind, and change its place, *viz.* from a Pleurisie into a Peripneumonie, and on the contrary; afterwards it passes from both or either into a Frenzy or a Squinancy: for that the blood while it is boiling throws off its viscous recements one while in this part, another while in that, another while in more together, and lastly it reassumes them again, and variously transfers them.

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The more remote causes of a Pleurisie are the same as of a Peripneumonie, *viz.* whatsoever stirs up the blood, predisposed to grow clammy and also to boyl up, and provokes a feverish turgescency. Hither appertains excess of heat and cold, a sudden constipation of the pores, surfeit, drinking of Wines or Strong-waters, immoderate exercise; sometimes the malignant constitution of the Air brings this disease almost on every body, and renders it Epidemical: whereto may be added, that this disease is very familiar to some from their constitution or custome; so that a distemperature of blood, induced almost by any occasion, immediately passes into a Pleurisie.

The more remote causes of this Disease.

From what we have already said, the signs of this disease do appear manifest enough, by which it is well known as to its Essence, and is distinguished from other diseases, and especially from a Bastard Pleurisie and a Peripneumonie. But it is to be observed that a pain in the side arises sometimes very troublesome; which while it counterfeits a Pleurisie, is sometimes taken for it, although falsely. For in some persons obnoxious to the Scurvy, and the affects of the nervous kind, sometimes it happens that a sharp humour, and very painful descends into the Pleura or intercostal Muscles, and being fixt there produces most fierce tortures; which distemper is yet discriminated from the Pleurisie, inasmuch as it is void both of Fever and Thirst, the Pulse always abides moderate and laudable, frequently the appetite and strength endure; moreover, the pain is not long fixed or limited to one place, but sensibly creeps hither and thither into the neighbouring parts, as the matter slides down through the passages of the fibres, out of one place into another.

We meet not with many differences of this disease; notwithstanding it is used to be distinguished, *viz.* to be either true and exquisite even as we have now described, or spurious, which having its seat in the intercostal muscles, or their interspaces, proceeds from wind, or a serous and sharp humour heaped up in the same place, and raises a pain less sharp, without so much as an inflammation or fever: And whereas the grief is planted externally, the Patient for the most part lyes better on the opposite side, otherwise than in a true Pleurisie. Secondly, a Pleurisie is either single, or complicated with a Peripneumonie or some other distemper, and so it is either primary, or secondary, or join'd with some other affection.

The differences of it.

As to the Prognostics of this disease, *Hippocrates* hath observed many certain tokens whereby a good or evil event is signified to Patients sick of the Pleurisie. To run through each of these, and to unfold them with Commentaries added to them, we have neither leisure, nor doth it seem worth our endeavours. The chief thing of all in a Pleurisie, is, that the disease be presently dispatch'd partly with a free and frequent bleeding, and partly by a Critical Sweet, arising about the fourth day, or before the eight; or these things not duely succeeding, it will be prolonged, and then most frequently a Peripneumonie or Empyema, or a Collection of corrupt matter between the Breast and Lungs, or both distempers do arise in this disease; from which there follows a solution of the disease but slow and incertain, and most frequently full of dangerous chances.

The Prognosticks.

A Peripneumonie coming upon a Pleurisie not presently cured (as it is often wont to be) all our hope is placed in digesting maturely the Spittle and quick Expectoring thereof: for if this be laudable and plentiful, and easily and hastily thrown off, it doth often finish both diseases intirely. Notwithstanding, it is not therefore a consequent that the matter of a Pleurisie is derived from the side into the Lungs by I know not what blind passages, or that the same being sweat out of the Pleura into the Cavity of the breast is imbibed by the Lungs, and at length drawn upwards through the passages, and excern'd forth. But when a Peripneumonie arises on a Pleurisie, and the matter impacted in the Lungs begins to be evacuated by Spittle, so that the affected places of the Lungs are continually emptied; the blood resumes the other matter fixed in the Pleura, and carries it to the Lungs where the places or conveyance are open, to be ejected by Spitting. But if the Pleurisie be cured neither by it self, nor associating with a Peripneumonie, then at length either by an Imposthume made in the Pleura or in the Lungs, an Empyema or corruption between the Breast and Lungs succeeds; or all the matter being brought into the Lungs and there putrified, loosning the unity of the Viscera, it propagates a mortal or scarce curable Consumption.

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The Cure there-
of.

As to the cure of the Pleurisie, forasmuch as the state of this Disease, the Crisis and tendencies are manifold, divers curatory Indications offer themselves according to their various regards; and as occasion serves, according to the advice of a prudent Physician, they ought to be appointed in the beginning, and sometimes altered or continued. For surely one Method is convenient for a solitary and simple Pleurisie, and another if it be complicated with a Peripneumonie. Besides it behoveth to ordain another and another if perhaps a Crisis be expected by Spitting, or matters growing worse, the disease is either passing into an Empyema, or tends to a Consumption. As to the three later cases, that is to say, when a Pleurisie commencing, passes into a Peripneumonie or Empyema, or lastly into a Consumptive disposition, there is designed an appropriate way of curing in the Pathologies of each of these diseases particularly delivered. But as to what appertains to our present purpose, three Indications offer themselves for a primary and simple Pleurisie, and they are curatory, preservatory and vital.

The first Indica-
tion.Phlebotomy ne-
cessary almost in
all Pleurisies.

I. The first Indication takes care that the Inflammation or obstruction of blood in the Lungs by all manner of means with all expedition be removed; for which intent Phlebotomie in every Age by all Physicians (excepting some Fanatick or false Chymists) is wont to be prescribed, as a principal remedy: The reason of which is altogether the same as in a Peripneumonie and many other distempers, caused by reason of a stop of blood in some place, and so an accumulation: Because that the vessels bringing blood being much emptied, do not only rescind the nourishment of the disease, but drink up the matter which is the conjunct cause thereof, and convey it to another place. Wherefore blood is to be freely drawn away in a Pleurisie, if the strength endure it, and the Pulse be strong. And surely it is far better that the first time and every time after (as often as there is need to repeat it) blood be more largely emitted, than to do it more often and more sparingly. For very many portions of the blood growing clammy and degenerating into viscosness, are heaped up about the place affected; which, unless they are call'd away from thence by emptying the Vessels through large Phlebotomie, and in a great part let forth, the letting of blood will be frustrated of its desired effect. Wherefore, that Physicians prescribe blood in a Pleurisie to be drawn out even to swooning, seems not incongruous to reason, although that practice is not rashly to be attempted, for that every evacuation ought to be proportioned to the tenour and tolerance of the strength, which rule such a Phlebotomy doth exceed.

What Vein is
to be opened in
a Pleurisie.Various opini-
ons are recited.

But though there is almost a general consent of all Physicians to breath a vein in a Pleurisie, notwithstanding there was ever an earnest contention about the place, what Vein ought to be opened. *Hippocrates* and *Galen* opened a Vein on the same side of the patient; afterwards the *Arabians* and their followers the *Italians*, and *French*, did either open the *Saphene* or the *Basilica* of the opposite side, damning the Phlebotomy of the same side by Bell, Book and Candle. Yet in the later generation, the practice of the *Ancient Greeks* by little and little revived, so that some did dare to make incision on the same side; yet always one side judged the others of the opposite persuasion as it were guilty of murder, as often as any unlucky event did happen. So that while among Physicians about Phlebotomy there was no less a contention than among the *Jews* and *Samaritans* about the Sacred place of Worship, at length the Doctrine of the Circulation of the Blood held out like a new Light by the most renowned *Harvey*, discus'd all the clouds of this Controversie; so that immediately it clearly appeared to be almost the same thing, whether incision be made in the Vein on the affected or opposite side of a Patient sick of a Pleurisie; although in our Age Custom hath prevailed first and rather to open the Vein of the affected side. Notwithstanding a Vein being opened in either Arm draws nothing at all immediately from the vertebral Artery or from the Pleura; they are only the branches of the Azygos, or of the vertebral Vein that receive the blood out of the place affected: but that they may accomplish this, they are not unloaded in any other manner, but that the quantity of the whole blood be abated by Phlebotomy wheresoever made. Onely this may be affirmed for opening rather the Vein of the affected side, that the Basilick Vein being unloaded, the Arteries of the Arm receive the more ample provision of blood; from hence the bloody stream of the Vein Aorta runs down more swiftly from that side towards the branches of the Arm, and perhaps in the interim of its quick passage it infuses less blood into the vertebral Arteries, for the nourishment of the disease. As to that opinion, that the blood is sometimes more plentifully carried from place to place, that from hence the right Lung or Liver being beset with an inflammation or obstruction, the right part of the head is in pain, and of the face grows more red; I say this sometimes is brought to pass, because the Patients do

do constantly lie in their bed on the side affected; wherefore, the Vessels being compress'd, the blood stays longer in other parts of the same side while it is circulating. But of these things we will make a more diligent search when we shall render the History and Ætiologie of Phlebotomy.

But if Phlebotomy by reason of a weak pulse, and fainting of the animal function, neither ought to be at first administred, nor repeated, though the pain be most urging; Cupping-glasses with Scarification do well supply the turn hereof, being applied to the place pained. *Riverius* and *Zacutus Lucitanus* have cited notable Examples of Cures effected by this remedy. And surely this practice seems to lean upon a reason strong enough; for the blood being drawn away from the side affected, that which is lodged in the neighbouring vessels, being the conjunct cause of this disease, is moved with it, and partly drawn away, and partly turned it to its Circulation. Moreover, to remove an inflammation of the Pleura, besides withdrawing blood by a free Phlebotomy or Scarification, also the ferous and other excrementitious humors ought to be gently solicited and excerned as well out of the mass thereof, as out of the bowels, by Stool, Urine and Sweat. The more strong Purgatives are deservedly prohibited, because they disquiet the blood, and constrain it to be impacted more deep into the places affected. And that certain renowned Chymists, viz. *Angelus Sala*, *Hartman*, *M. Rulandus*, with many others, do audaciously exhibit Vomits of Stybium to any afflicted with a Pleurisie, and magnifie it for the best remedy, seems to me neither safe nor congruous to reason; the only reason of helping, as I think, and that very uncertain and full of danger, may be, viz. that the medicine operating more vehemently while the Patients suffer exolution of spirits or swoonings, all the vigour and turgescence of the blood abates, and for that cause the nervous Fibres remit their wrinklings or painful contractions, and the Vessels carrying blood being much emptied, do suck up the morbidick matter: In the mean time, there is danger lest the humors being violently disturbed, rush more impetuously to the part affected; at least, lest the Spirits being too much dejected, and the work of Nature disquieted about the digesting or separation of the morbidick matter, strength should utterly fail, before the disease be cured. Yet in the mean time, Clysters are of frequent or daily use: yea sometimes more benign solutive purgatives are allowed, provided that the Fever be not very intense. Julips and temperating Decoctions and things gently moving Sweat and Urine, as we have prescribed before for a Peripneumonie, are also here convenient; but let all hot and sharp things, whether aromack, or endowed with a vinous spirit be carefully declined.

II. The second Indication preservatory, designed against the clamminess and boyl-ing up of the blood, prescribes Medicines of that sort which consisting of a volatile or alcalized Salt, do destroy the combinations entred into, of the acid and fixed or otherwise distempered Salts, with the other more thick particles. For which intent the Eyes or Claws of Crabs, the tooth of a Boar, the stone of Carps, the jaw of a Pike Fish, the Bone in the Heart of a Stag, the Priapus of a Hart, Sal Prunella, Salt of Coral, Salt of Urine, or volatile Salt of Harts-horn, powder of Goats-blood, infusion of Horse-dung, Spirit of Harts-horn, of Salt Armoniack, Spirit of Tartar, the simple mixture, mineral Bezoar, Diaphoretick Antimony, flowers of Salt armoniack, are very famous Remedies in a Pleurisie.

III. The Third indication vital which provides that the strength and vital heat be preserved during the course of the Disease in due tune and state, gives in precept first an apt kind of food, and moreover Cardiac and Anodyne remedies, and those which seasonably occur to other symptoms, if perhaps they arise. First, in a true Pleurisie, a most thin Diet ought to be appointed, viz. of meer Oatmeal and Barley; and for ordinary drink, a Ptisan or Posset-drink rather than Beer alone is convenient: although in an outrageous thirst this also is to be allowed of in a moderate quantity. Moreover, for quenching thirst, Juleps, Apozemes, and Emulsions are taken by turns; to all which add Sal Prunella. Secondly, let only the temperate Cordials be administred which mildly do recreate the animal Spirits, and not at all intend the kindling of the blood, burning out of its due proportion. For these intentions, the water of *Carduus Maria*, *Carduus Benedictus*, of Balm, Borage, Cowslips, Black-cherries, are usually given with success: whereto let the powder of Pearls and Coral be added. Thirdly, It behoveth to administer Anodynes, both inwardly, to provoke sleep in case it be very much wanting, and also externally, to alleviate the pain of the side. Of the former kind the more usual are the distill'd water, Syrup and powder of red Poppies, which are esteemed Specificicks in a Pleurisie and in a Peripneumony: Moreover, when the pain is very acute, and watchings instant upon the Patient, they may lawfully drink Diacodiates. Against pains, Liniments, Fomentations,

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Cupping-glasses
with Scarifica-
tion supply the
place of blood-
letting.

Whether Purges
and Vomits are
to be taken in
a Pleurisie.

What other kind
of Remedies are
convenient in
this disease.

The second Indi-
cation preservatory.

The third indi-
cation vital.

Cardiacs.

Anodynes.

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tions, Cataplasmes, and sometimes the hot bowels of Animals newly slain are convenient to be applied. These are the principal Intentions of healing which seem requisite to cure an exquisite and simple Pleurisie, before it contracts a Peripneumonie to it self, or passes into it or into an Empyema. It only remains to adapt to each of these the more select forms of Medicaments.

Forms of Remedies.

First therefore in the beginning of the Disease, for taking away the Phlegmon, Juleps, Apozemes, Powders, and gentle loosening Clysters are wont to be prescribed.

First for the removing the Inflammation.

Take water of *Carduus Maria* eight ounces, red Poppies 4 ounces, Syrup of red Poppies one ounce, sal *Prunella* one drachm, make a Julep, the dose two or three ounces every third hour.

Juleps, & Apozemes.

Take of Grass-roots 4 ounces, Barly half an ounce, Apple-parings one handful, Raisins one ounce, Liquorish two drams, boyl them in three pints of Spring-water to two; clarify the strained liquor, adding Syrup of Violets one ounce and half, sal *Prunella* one dram and half, make an Apozeme, the dose 3 or 4 ounces often in a day.

Powder.

Take of sal *Prunella* two drams, flowers of Nitre one dram, powder of red Poppy flowers two scruples, Sugar-sandy four scruples, make a powder, the dose half a dram three or four times in a day.

A Purg.

Take of the Decoction of Mallows, leaves and roots, with Prunes, one Pound, Syrup of Violets three ounces, sal *Prunella* one dram, make a Clyster.

Take Cassia bruised two ounces, Tamarinds one ounce, Damask-Rose leaves one handful, Coriander-seeds two drams, boyl'd in Spring-water to a pint, strain it, and add Syrup of Chichory with Rhubarb two drams, clarify it with the White of an Egg, the dose is 5 or 6 ounces in the morning, continued for two or three dayes.

Secondly for the taking away the Cramminess of the Blood.

Secondly, The following are of use to dissolve the clamminess or coagulating viscosity of the blood, in the form of a Drink, of a Powder and of Spirit:

An infusion of Horse-dung.

Take fresh Horse-dung 4 ounces, *Carduus-water* one pound and half, infuse it warm for two hours, after filtre it, to which add Syrup of the juice of Dandelyon, or of Chichory two ounces, Spirit of salt Armoniack one dram, let five or six spoonfuls be given three or four times in a day.

To this end Water of Horse-dung wonderfully profits.

And distilled water.

Take of Horse-dung 4 pounds, leaves of *Carduus Benedictus*, *Carduus Maria*, Scabious, Pimpernel, of each three handfulls, upon them cut and mixt together pour six pints of new Milk, distill them in common Organs. The Dose is from two ounces to three, either with self or with other distill'd Waters, in form of a Julep.

Sylvius's Anti-Pleuritick.

For the same use, the Tinctures, or the solutions of other Dungs are administred by some Physicians, and highly magnified by them. *Helmont* commends the dung of an Ox, *Panarolus* commends Pidgeons-dung, others the white dung of a Cock, for the Pleurisie. *Epiphanius Ferdinandus*, was wont to give with success the Decoction of Tobacco with new Wine; *Valeriola* by experiment as a familiar remedy made use of the Decoction of the Flowers of red Poppies: The renowned *Sylvius* prescrib'd the following mixture to be taken by Spoonfuls, within short spaces of time.

Take Parsly and Hyssop-water, of each two ounces, Fennel-water one ounce, Treacle-water simple half an ounce, Laudanum Opiate 4 grains, Salt Armoniack half a scruple, Syrup of red Poppies one ounce. Mingle them.

Frederick Deckers adds to this the Powder of Crabs-eyes, and Mineral Bezoar, of each one scruple.

Medicines chiefly efficacious for this use are wont to be administred in form of a powder: for examples sake.

Powders.

Take Powder of Crabs-eyes two drams, sal *Prunella* one dram and half, of the flowers of red Poppies half a dram, mix them and make a Powder, the dose half a dram, three or four times a day, in a convenient Vehicle.

Instead

Instead of Crabs-eyes, the powder of the Jaw of a Pike, or the Tusk of a Boar, or the Pizzle of a Stag, or Bull, are used, and if they prove ineffective, try the following. P H A R.
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Take of *Antimony Diaphoretick*, or the *Cerufs* thereof, or *Bezoar Mineral*, two drams, the volatile Salt of *Harts-horn* half a dram, the powder of red *Poppies* two scruples, make a Powder; The Dose from one Scruple to half a dram, three times or oftner in a day.

For the same intention of curing it was, that *Riverius* gave of the Powder of *Soot* from half a dram to a dram; others the powder of *Pidgeons dung*, or of a *Cock*. And indeed by reason of this Analogy, whereby the dungs of Animals stored with volatile Salt, do succour in this Disease; it is probable, the dung of a *Dog* doth no less conduce to cure a *Pleurisie* than a *Squinancy*, and so much the rather, because these Diseases frequently change their forms among themselves, and one assumes the species of the other. Chymical liquors endued with a volatile Salt do also notably help sometimes in a *Pleurisie*.

Take of *Spirit of Blood* two drams, *Water of red Poppies* three Ounces, the *Syrup of the Chymical Li-*
same one ounce. Let it be given by spoonfuls often. quors.

Take *Spirit of Sal Armoniack*, distill'd with *Oblibanum*, three drams, the dose from 12 drops to 15 or 20, twice or thrice a day, in any convenient liquor. After the same manner the *Spirit of Urine*, *Soot*, or *Harts-horn* may be given.

Take the *Spirit of Tartar* 3 drams, the dose one scruple in a convenient vehicle.

Take of the simple mixture 3 drams; Dose from one scruple to half a dram.

As for the third Intention, besides a thin diet, Cardiac remedies and Anodynes are prescribed. Examples of the former kind for the first indication may be supplied by *Juleps* and *Apozemes*; for the second Indication they may be supplied by *Spirits* and *Powders*. Anodynes are prescribed to be exhibited inwardly upon watching, and very intense pain, according to the following method. What remedies
the third inten-
tion requires.

Take of *Poppy-water* two ounces, the *Syrup of the same* 6 drams, *Spirit of Harts-horn* 12 drops, make a draught to be taken at Bed-time.

If we must proceed higher, Take *Carduus-water* two ounces, *Diacodium* from three drams to half an ounce or 6 drams, *Spirit of Sal Armoniac* with *Frankincense* half a scruple, make a draught: and sometimes although rarely *Laudanum* is expedient, which timely given, inasmuch as it excites sleep, and moves *Sweat & Urine*, does greatly profit. Hypnotick Ano-
dynes.

Take *Comfisp-water* two ounces, *Tartariz'd Laudanum* from 16, drops to 20. the *Spirits of Blood* half a Scruple, *Syrup of Violets* two drams, mingle them for a draught.

Outward Anodynes in form of a Liniment, Fomentation, and Cataplasim, are usually prescribed. External Ano-
dynes.

Take *Oyntment of Marshmallows* two ounces, *Oyl of Almonds* one ounce, *Dogs-turd* two drams, mix them by grinding together.

Take the *Plaster of Mucilages* two ounces and a half, moistened with *Linseed-Oyl*, and applied upon *Lawn-paper*.

Take the tops of both *Mallows*, the leaves of *Mercury* and *Beetes*, of each 4 handfuls, boyl them in *Spring-water*, and strain'd, let it be used for Fomentation.

Take the *Dregs of the herbs* after the liquor expressed, to which add the bran of *Oats* 6 ounces, *Linseed* and *Fennugreek-seeds*, of each two Ounces, *Oyntment of Marsh-mallows* two ounce, make a Cataplasme.

There is no occasion to go far for Histories and Instances of Patients sick of a *Pleurisie*, for a notable Example of this disease is now under our hands: to wit, A very lovely Maid, frequently and as it were habitually obnoxious to that distemper, is committed to our care. This Virgin being very amiable, of a sanguine complexion, but of a weakly constitution, upon any the smallest occasion, viz. by taking cold, or by errors in any of the six Non-naturals, yea sometimes from the meer alteration of the year, or the air, has for many years been wont to fall into a fever; whereupon immediately *Pleuritick* pains, with a Cough and difficult breathing come upon her, and afterwards for the most part hideous *Convulsions*: under which passion in time past she did so grievously labour, that frequently every year for above six months she was constrain'd to keep within her Chamber. But of late, though she is not acquitted from An History.

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from this hurt, yet she is seldomer punish'd with it. The last year all the Summer, and almost the Autumn, she enjoyed her health indifferently; in the beginning of Winter she took her bed with this sickness, and now about the end is again sick. A pain from the Pleurisie constantly afflicts her right side, where the blood sticking in its passage, and being extravasated about the intercostal muscles, the Fibres being provoked, fall into a most troublesom condition, together with a Convulsive motion of Coughing, and almost perpetually repeat it: In the mean while her Lungs being sound enough, and open as to the passages, do readily convey the blood without any stop by its clamminess, (which frequently is the Author of a Peripneumonie.) No remedies that are used will do her good without Phlebotomie, which continually is so very necessary, that upon every return of the sickness, in spite of all things we are compelled three or four times to repeat it, and sometimes oftner: the blood let out in the Superficies hath constantly a viscous and whitish filme. This disease was ever a simple Pleurisie void of a Peripneumonie, and for cure she with constant success used the following method.

Take Spirit of Sal Armoniack distilled with Gum Ammoniacum three drams; take from 15 drops to 20, three times aday, with the following Julep.

Take Carduus and Black-Cherry water, of each six ounce s, Hysterical Water one dram, Sugar 6 drams. Between whiles she took a dose of this Powder with three ounces of Apozeme.

Take Powder of Crabs-Eyes, of a Bores tooth, Sal Prunella of each one dram, make a Powder for six doses.

Take Grass-roots 3 ounces, candied Eringo one ounce, Shavings of Ivory and Harts-horn of each two drams, the Parings of Apples one handful, Raisins one ounce, boyl them in three pound of Spring-water to two pound, to it strain'd add Syrup of Violets one ounce, sal Prunella one dram, mix them, and make an Apozeme.

Clysters of Milk with Syrup of Violets were injected, sometimes every, sometimes every other day. If Opiates, however mild, were given to allay pain, upon it a pain and drowsiness of the head, and Convulsions did infest her most grievously.

SECT. I. CHAP. X.

Of an Empyema.

An Empyema is the product of other diseases of the breast.

IT is clearly manifest from what hath been said before, that a Pleurisie, and Peripneumonie, are diseases not only akin but commutable among themselves and successiveto one another; Moreover, as well this as that, and frequently both together, not being well cured, do pass into an Empyema. For when a Phlegmon rais'd about the Pleura is brought to suppuration, at length the Imposthume being broke, the matter falling into the cavity of the Thorax, produces this disease. In like manner sometimes it follows from the Lungs being inflamed: inasmuch as the Ichor accumulated about the place affected, turns into a thick and yellow humour by a long digestion, which unless it be ejected by a Cough, either sensibly corrupting the inner substance of the Lungs, it causeth a Consumptive disposition, or dissolving the unity of the intire Lungs, and at length corroding the outmost membrane, it slides down into the Breast, and so engenders an Empyema. Any one labouring with an Imposthume or Ulcer of the Lungs, although he do spit out abundant and foetid matter (as it frequently happens in an Imposthume of the Lungs,) is not therefore accounted obnoxious to an Empyema. For in truth, by the common acceptation of this Term is signified a Collection of rotten matter within the cavity of the Thorax, by which the Organs of breathing are oppressed: but that rotten matter is wont to have a conflux thither either by a Pleurisie or Peripneumonie, (and sometimes perhaps from a Squinancy) brought first to suppuration and afterwards broke.

It rarely or never begins of itself.

Forasmuch as an Empyema never begins primarily and of it self, but for the most part is the effect or product of other diseases, not duely Cured, it will not be requisite to make much inquisition about the causes thereof. The formal reason or conjunct

conjoint cause thereof is known well enough (to wit) it is a purulent matter, poured out from the Pleura, or the Lungs, or the Larinx, into the cavity of the Thorax. But the other proper causes of the previous effects, appertain to the Etiologies of every of them.

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Part. II.

There is a certain dispute about the morbid matter; for some contend that it is meer corruption, others not that, but that it is a purulent matter, of which opinion is *Johannes Heurnius*, who averring a purulent matter for the conjoint cause of an Empyema, distinguishes between this and mere and pure Pus, affirming this to come to pass from a bloody nutritious humour, i. e. from the blood it self somewhat corrupted, but capable of digestion, but that a purulent matter, is an excrementitious humour, viz. a Serum or Ichor, which proceeds from the blood obstructed and hindered somewhere in its Circulation. From hence we may observe concerning an Imposthume which affords true and laudable Pus or matter, that it is for the most part compact, every way shut up and wrapt up together either in a bladder, or (as it were) within private Apartments, and then after it is maturated and broken, pours out the contained humour, and is soon and easily healed. But an Imposthume affording a purulent matter forms its nest not so bound up and encompass'd by walls, but for the most part unequal and crooked, and being broken rather pours out filthy blood or gore than matter or Pus, and then by reason of the successive source of excrementitious humour, it is very difficultly healed.

What the morbid matter is.

The difference of Pus and a purulent matter.

Moreover, we are to consider, that each humour as well Pus as purulent matter doth sometimes stink notably, and is also sometimes very free from any bad savour. Some maturated and broken Imposthumes pour out fetid matter, others matter without any smell. I have often observ'd Imposthumes of the Lungs, as well as Phlegmons of other parts to have this several distinction. Purulent matter from many Ulcers stinks ill; the Spittle of Consumptive persons which is esteemed to be very dangerous, for the most part is without any scent. It is usual where the side is opened by reason of an Empyema, that at first the matter flows out not unsweet, but after two or three days the air having more frequently enter'd into the orifice, it stinks most horribly: which stench notwithstanding after an injection of some aromatical or vinous Spirit vanishes again in a short space. But it would be a thing of much tediousness to denote the particular reasons of each of these accidents and alterations, for that never so little alteration of Pus or purulent matter, both causes and removes that stench from them. When the sulphureous Particles are equally digested, and being subjugated to the salts are contained in a mixture, there is no stench; but as soon as they being loosed begin to fly away, and carry the salt particles with them (whereby they are sharpened) they disperse a very bad stench round about. But whereas an Injection or Lotion with vinous and aromatical liquors, being sometimes administred to a putrid Ulcer or nest of an Empyema, frequently removes all stench; the reason is, because the sides of an Ulcer, no otherwise than as a stinking pot, infect the contained liquor as with a certain ferment, and so impress a stink: but when that ferment of the vessel or bowel is washed or overcome by a well-tempered and strong liquor, then that propagation of a stench ceaseth. From hence follows not always an ill sign, nor is it so very good, if the Spittle of consumptive persons, and the Imposthumes of such as are Empyematical are excerned either with, or without stench; for that I have known it to have been to some healthful, and to others deadly in either case. Moreover a more certain Judgment it not to be taken from thence, that the Spittle of some Consumptive persons floats upon the water, and that of others sinks.

Why both sometimes with and sometimes without stench.

But although we do not much disapprove of that distinction of Pus and purulent matter, notwithstanding we adjudge neither only this, nor always that, to be a conjoint cause of an Empyema. Whenas this disease succeeding a simple Pleurisie, arises from an Imposthume being suppurated and broken in the side, it is most commonly pure and meer Pus, which falling into the Cavity of the Breast, engenders that disease. But if an Empyema be an Offspring of a Peripneumonie (unless an Imposthume of the Lungs intervene) the ichorous matter being accumulated about the place of the phlegmon, and after thickning by meer concoction, it wounds the Lungs, and at length making a hole through the membrane encompassing it, and flowing out into the Thorax, produces an Empyema. That matter is rather to be accounted purulent than meer Pus.

Neither the cause of an Empyema.

The signs of an Empyema either prognosticate it while it is in fieri, or indicate it plainly done. Some foregoing diseases are esteemed of the former sort, whose issue this uses to be, of which sort are the Pleurisie, Peripneumonie, and Squinancy, also sometimes a stroke or wound of the breast, and sometimes other distempers thereof,

The Signs of an Empyema whilst beginning.

not

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When perfect.

not well cured, nor discharged; out of which the suspicion will be greater of an Empyema to ensue, if after one or two weeks without abundant Spittle, the shivering of an Ague and fainting of the Spirits overtakes one. Then after fourteen or twenty days, there will be signs of an Empyema fully made, as difficult breathing, a heaviness of the breast, a swimming to and fro of the matter, and a sense of pain from the position of the body chang'd, thirst and a small feaver almost continual, redness of the cheeks, disquietness of the whole body, and watching.

An Empyema is distinguished many ways, viz. First according to the distemper going before, whose Offspring it is; also according to us seat, one while in the right side of the breast, another while in the left, and another while in the whole capacity thereof; and lastly, as to the morbid matter, which is either meer and laudable Pus, or purulent matter, and this one while gentle, and benigne, and another while sharp and stinking.

Prognosticks of this disease.

Prognosticks of this disease begin as well before as after incision; the former determines whether the side ought to be opened or not, also it presages of what sort the event will be, either with or without opening. If an Empyema succeeds more slow, after the first distemper, to wit, not before the thirtieth or fortieth day, whereas the strength is very much worn, and the Lungs are vitiated, and their structure hurt; and also if a feaver remain as it were hectic, the breathing short and painful, the Pulse weak and quick, with cold sweat, and with a Diarrhea or wasting looseness, and frequent faintings of the Spirits, then the state of such a person being evidently desperate, doth not admit of any opening; let a Physician suffer him to dye without bleeding, lest he seem to murder him. But if on the contrary, after manifest signs of an Empyema more maturely perfected, the painfulness of the Lungs or side, as also the feaver and other symptoms abate, and the Pulse, and strength of the Spirits are in vigour, it will be lawful safely to advance to cutting, and thereby to hope a happy success. Incision being made, if white Pus duly concocted or otherwise laudable skip out with ease, and thence the heaviness of the breast and difficult breathing abate, and the Patient is better as to the other Passions, there will not the least doubt remain of his cure: but if no Pus, or that which is bad, if thin, something bloody or stinking, flow from the side being opened, we can conceive thereby but small hope of recovery.

What it signifies when the Probe is gilded by the Empyematical matter.

Hippocrates among the presaging signs of a mortal Empyema, recounts that of the Probes being coloured by the Pus, as by fire; or what we often observe and sometimes without any evil event, if the silver Probe being put into the orifice of the open'd side, be presently ting'd with a colour as it were of Gold or Copper; which surely signifies no other thing but that the sulphureous particles of the Pus, or purulent matter are so exalted, and loosen'd from the bond of mixture, that easily departing they may be affix'd to any other body, and especially silver, whereunto they are akin. Sometimes I have seen Vension kill'd by long and wearisome hunting, presently bak'd in an Oven for Entertainment, become not only most tender, inasmuch that it might be taken out with Spoons, but even to have gilded a bright silver Spoon at the first touch. The reason whereof is the same with the former, viz. that the flesh was so disposed to putrefaction by too much exercise while the Animal lived, that the particles of the Sulphur being exempt from Concretion, and apt to fly away, presently adhere to any other fit Subject: But this by the by.

The cure of the disease.

As to what belongs to the curatory part of an Empyema, we ought chiefly to consider whether the signs of this disease being now perfected, be certain, or doubtful. In the former case there will not be much need of medicine, but the body only being prepar'd before-hand, we may immediately proceed to the opening of the side. Wherefore, if from a Pleurisie or Peripneumonie not rightly cur'd, or from blood poured out after a stroke, fall, or inward wound, a fluctuation of Pus or purulent matter, or bloody within the cavity of the Thorax, be perceived, with no Spittle, or with little, there will not be need that we dwell longer on maturing or expectorating Medicines, but the belly being loosened, and the blood and humours rightly temperated by Juleps, Apozemes and Anodynes, either that a bare Section be ordained; or that in tender and fearful persons a Cautey be applied between the 6th and 7th Vertebra, and after the Eschar is rais'd the Incision-knife be obliquely forc'd by little and little, towards the hinder and upper part, until it penetrate into the very Cavity of the Thorax; afterwards, a little silver Pipe being put in, let the

The cutting or opening the side.

The Empyematical matter is wont to stink by the often admission of the Air.

contained matter be sent out by degrees; notwithstanding in such manner, that, if his strength will bear, an evacuation of the whole humour be accelerated; for a portion thereof being left within, often contracts a hideous stench, within a few days (by reason of the Air, as is abovesaid, being admitted) which evil, that it may be

be provided against, or soon removed, a vulnerary and absterfivè liquor is to be cast in twice or thrice aday by a Syphon or Syringe. It will not be requisite to prescribe particularly the other things belonging to this operation, and the process thereof; for that each of these things are evidently known to any of the more expert Chirurgeons, and are used in familiar practice. After incision and the appertaining administrations rightly performed, there will not be much besides left for a Physician to doe. It is convenient there be a right course of Diet, a frequent loosening the belly (as often as need shall be) by Clysters; and moreover it behoveth us to prescribe remedies vulgarly called Vulnerary, which hinder the dissolution of blood, and the profusion thereof into ferosities injurious to the breast.

But if the Signs of this Disease be less certain, and (as for the most part it is wont to be, from a Peripneumonie and Imposthume of the Lungs going before) altogether doubtful, Incision must not too soon or rashly be made. For I have known some spitting forth a purulent matter, yea a fetid Pus, with painful breathing, and heaviness of the breast, to have undergone a Paracentesis in vain, and not altogether exempt from hurt. Wherefore, until it is apparent by pathognomic signs that it is an Empyema confirm'd, expectorating medicines (as are before prescribed for the cure of a Peripneumonie) as also things gently moving evacuation by Urine and Sweat, may be used for some time: But these availing nothing, and the Empyema still remaining or increasing, (because whilst there is strength it is better to try doubtful Medicines than none) proceed to a Paracentesis.

Those things which persuade or forbid a Paracentesis.

As to the Forms of Medicines requisite to the curing an Empyema, before Incision, the same remedies that are prescribed in a Peripneumonie are convenient; but the Paracentesis being made, these following will be chiefly in use.

Against fainting of the Spirits, and swoonings which happen in that operation, or afterwards, let the following Julep be at hand to be taken now and then about four or five Spoonfuls.

Take Balm and Black-cherry water, of each six ounces; Aq. Mirabilis one ounce, powder of Cardiacs. Pearl one dram, Syrup of Gilliflowers one ounce. Mingle for a Julep.

The following Decoction to be drunk three or four times aday.

Take of Harts-tongue, Speed-well, Agrimony, Colts-foot, Monsear, Sanicle, of each one handful, Madder and Chervil-roots of each one ounce, Barly half an ounce, red Cicers half an ounce, Raisins an ounce and half, boyl them in four pound of Spring-water to half, sweeten it with clarified Honey, or with Syrup of Mouse-ear as you take it, to your pleasure. If a Fever be wanting, the following Pills may be taken from one scruple to half a dram, Evening and Morning.

A Vulnerary Decoction.

Take powder of Crabs-eyes two drams, Flower of Sulphur one dram, Sal Prunella half a dram, Spec. Diarrhodon Abbatiss one scruple, Venice-Turpentine washed, make a mass formed into small Pills, or omitting the Turpentine, take the powder from half an ounce to two scruples, twice in a day.

Examples of persons sick of an Empyema are not so frequent, and those cured of that Distemper more seldom. I have known two, unwilling to admit of an Incision prescribed by all means by the Physicians, to have fatally expired, and their dead bodies I have dissected. Also I saw that operation administred to two others, whereof one recovered health, the other dyed consumptive; but the reason thereof was, his Lungs being notably corrupted, and his strength utterly lost, the too late opening his side conferr'd no help to him; but did much depress his spirits, weak enough before, and wasted his strength. He whose side was opened, had Lungs sound enough; but from the Imposthume of the side being broke inwardly, the matter falling into the Cavity of the Thorax did so compress the Diaphragma that he could scarcely breathe. The Chirurgeon without a Caustick thrust in his Incision-knife between the 6th and 7th Vertebra, and having made a hole quite through his flesh, he put in his Pipe. A bloody ichor first flow'd out, afterwards being drawn away by a moderate quantity at times for three dayes, it flow'd out without any stench; but afterwards as often as the Orifice was opened, a most horrid sinell came forth, exceeding the stench of any Jakes, though ne're so stinking, and infected the whole Chamber with the ill scent: Moreover it remain'd so for many days, until by injections made of Myrrh and bitter herbs, boyl'd in Water and Wine, and very often administred every day, at length it was extinguished; by the daily use of which, the morbid matter and at length all the sordidness being washed away, all flowing out ceased; and last of all the

An History of one troubled with an Empyema, the cutting of whom was mortal.

Of another who recovered by that remedy.

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*The History of
one who dyed
because he was
not cut.*

Orifice being closed, the Patient recovered his entire health. I dissected the dead bodies of those who dyed, when by no perswasion of Physician or Friends they would admit of the opening of their side. One I have spoke of otherwhere, the result whereof was, the Pus streaming from the Imposthume raised in the Pleura, and in the intercostal Muscles; and broken internally, had wasted part of the affected place, and of the contiguous Lung, with a Sphacelus or Gangrene, and so corroding the Diaphragma, and a hole being made on the right side thereof, it had descended into the Viscera or bowels of the lower belly: and there in the whole passage of the Ventricle and Intestines, the outer Coats on which the purulent matter had fallen, appeared eaten and discoloured; and at length the purulent matter corroding and boring through the *intestinum rectum*, it came forth through the fundament together with his excrement. The sick man being strong and impatient of any Medicine, endured the tyranny hereof for about two months, but in the mean while he lived miserably, afflicted with a light Feaver, thirst, inquietude, pain of the stomach, and frequent tumbling up and down, and almost with continual watchings. His body being opened after his decease, a most horrid stench, exceeding any Jakes, diffused it self throughout the whole Chamber. The Anatomy of another who dyed by an Empyema, afforded not so vast an effusion of purulent matter. This indeed had its nest in his side, from whence falling into the cavity of the Thorax, and there accumulated in a vast heap, and continually defiling his Lungs drenched therein, it caused a slow and as it were a hecstick Feaver, whereby the Patient, being very old, dyed.

*A fourth History
like the former.*

SECT. I. CHAP. XI.

Of an Imposthume of the Lungs.

*Vomica Pulmonis
is a disease seldom
observed.*

A Vomica of the Lungs is something a-kin to an Empyema or Peripneumonie, considering that the morbid matter is always meer Pus, which notwithstanding is generated in the Lungs without a Feaver and Phlegmon, yea without any great Cough or Spittle, as it were silently, and without noise; and frequently this evil doth not discover it self before it kills the Patient. Galen makes mention of this in *lib. 1. de locis affectis*; but among Authors who have written Systemes and the practical parts of Physick, mention thereof is seldom or scarce to be met with. *Tulpius* in *lib. 2. chap. 10.* describes this distemper after this sort. *This evil (meaning an Imposthume of the Lungs) lurks in the beginning so secretly that it scarce discovers any signs of it self, besides, in the first place, a little dry Cough, and presently moist; which continuing for some time, the breath is drawn with difficulty, the spirit fails, and the body withers by degrees, although in the mean time the Spittle makes no shew, either of pus or blood; and if the Imposthume break by way of surprisal, the man is kill'd immediately.* It is wont sometimes so to happen, but I have known many who in an Imposthume rising insensibly, being maturated, and at length breaking, have spit up great plenty of fetid corruption; and though with voiding daily such a Spittle, for many weeks, nay months, they became very weak, and as it were, consumptive, yet at length by the help of Medicines after the Ulcer hath been mundified, and dried, they have recovered their health entirely.

*The formal reason
and conjunct
cause thereof.*

This disease, if we search into the formal reason and conjunct cause thereof, is in truth a concurrence of ill humours gathered in some part of the Lungs; whose matter although it be heterogeneous and an enemy to nature, notwithstanding from the beginning appears not sharp, or irritative. For when at first being separated from the blood, it is deposited in some hollow place of the Lungs, perhaps in some bladdery cell, it doth neither raise a Cough nor produce a Feaver; but afterwards when sensibly increased it compresses the neighbouring Vessels bringing blood, and moreover insinuates into the very blood passing by, incongruous Effluvia; from thence a small Feaver succeeds, with a certain inquietude, and spebleness; and at length being accumulated to its fulness, and maturated by a long digestion into mere Pus; breaking its nest very much distended before, it flows out every where all about. But if the ways are not open for the issuing of the Pus, it incontinently mingles it self with the blood, and either imposts it, or impedes it from Circulation; or rushing by heaps into the Tracheal passages, it doth fill most of them at once, and so stuffs them, that a sufficient entrance is denied to air to kindle the blood, and presently the vital flame expires: but

but if this matter find passage, and flow by degrees into the Trachea, from whence again it may be presently carryed away, and spit out, there will be then some truce of life, with hope and opportunity of cure. And indeed I have known many cur'd of this disease.

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The usual matter of an Imposthume of the Lungs is meer Pus, which often stinks notably, and by that differs from the Spittle which is ejected in a Peripneumonie or a Consumption of the Lungs. But whence that matter proceeds in the beginning thereof, and of what disposition it was before it was ripened into Pus, I cannot so easily determine: because the seeds of this disease being privily sow'd, and growing up secretly, spring wholly from an occult original; wherefore its procatastick or more remote causes lye conceal'd, yea while it begins and encreases, can neither be discovered by any pathognomical Signs, nor can any prognostick be devised, before it discovers it self with a mortal stroke, but the whole procedure thereof is treacherous.

The morbidick matter.

Now if after the Imposthume is broke, and the Spitting up of Pus with an easie discharge being begun, with a constancy of strength, there be means offer'd for some method of cure, the chief Indications according to the common custom in most diseases will be these, viz. Curatory, preservatory, and vital. The first commands the matter of the Imposthume speedily to be discharg'd by Spittle, and that the sides thereof should be cleansed and healed as much as is possible. The second Indication provides against the conflux of new matter to that nest, or other adjoining places of the Lungs (whence a Consumption may be engendred). The third restores the languishing of the Spirits, the lost strength, and the frustrated Nourishment.

1. As to the first Indication, remedies commonly called expectorating, and of them those that are more hot and sharp, and do very much cleanse and drye, but especially (for that for the most part here a Fever is wanting) sulphureous remedies are expedient; which also may be prescribed according to the following forms.

First Indication.

Take of Tincture of Sulphur three drams, take from seven drops to twenty, at bedtime, and early in the morning in a spoonful of Syrup of the Juice of Ground-Ivy, Or, Take our syrup of Sulphur, as before set down, 6 ounces, let a spoonful be taken at the same hours.

Forms of Remedies.

Take the dried leaves of Ground-Ivy, Germander, white Maiden-hair, Coltsfoot, Hyssop, white Hore-hound, Savory, of each one handful, Enula-campane, Orris and Chervil roots, of each one ounce, Anniseeds half an ounce, boyl them in 6 pound of Spring-water to three pound and a half, adding towards the end White-wine 6 ounces, clarified Honey three ounces. Let the strained Liquor be clarified, and kept for use: the dose 6 ounces warm, three times a day. Or,

Take of Lime-water 6 pound, put it in a Glass with a large mouth, hanging in it the following bag.

Take the dried leaves of Germander, Ground-Ivy, white Horehound, of each one handful, Orris and Enula-campane sliced one ounce and a half, Anniseeds bruised two ounces, Liquorish an ounce and half, Raisins stoned three ounces, let them be stopt and stand cold. Pour out for use, the bag remaining.

Take Lohoch Sanum three ounces, Species Diaireos two drams and a half, flower of Sulphur one dram and a half, of simple Oxyssel two ounces, make a Linctus to be lick't with a Liqueurish-stick.

Take the powder of Hedge-mustard, Ground-Ivy, of each half an ounce, flower of Sulphur a dram and half, syrup of Sulphur (or of the juice of Ground-Ivy) what will suffice to make a Lohoch.

Take of fine Mirrh, of white Amber, of each half an ounce, Sulphur Vivum, Auripigment, of each two drams, the rinds of Pistaches one dram and a half, make a powder for Fumigation, to be used in a Paper-funnel, morning and evening.

2. The preservatory Indication, abolishing the morbidick matter, and so providing against a Phthisis prone to succeed; endeavors the purifying of the blood, and strengthening the Lungs, to which ends, Purgers, Vulnerarie Decoctions, distill'd waters and physical Drinks, are convenient.

Second Indication.

Take of the Decoction of Senna of Gereon (with one dram and half of Agarick) three ounces and a half, purging Syrup of Apples one ounce, Aq. Mirabilis two drams, make a potion to be taken with government once in a Week.

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The form of the Wound-drink let be the same as was prescribed for an Empyema after opening, or 4 or 6 ounces of the Decoction common in Shops, three times aday, (because here is no fever.)

Take of Firr-tops 6 M. fresh Ground-Ivy, Hyssop, Sage, Rockets, Hedge-Mustard, Sr. Barbaries herb or Winter-creffes, of each four handfuls, the seeds of the Sun-flower 6 ounces, sweet Fennel-seeds two ounces, Enula Campana, Orris-roots, of each 3 ounces, being cut and bruised, pour upon them 8 pound of Brunswick Mum or Spruce-Beer, distill it in a cold Still, let the liquor be all mixt, and when used, sweetned at pleasure with syrup of the juice of Ground-Ivy; the dose three or four ounces, three times aday.

Take of the roots of Sarsaparilla six ounces, China two ounces, of each of the Sanders six drams, Shavings of Ivory and Hartshorn, of each half an ounce, Mastick-wood one ounce, being cut and bruised infuse them in 12 pound of Spring-water, boyl them to half, adding one ounce of Liquorish, Raisins 4 ounces, let the strained liquor be kept for ordinary drink.

Third Indication.

3. The vital Indication prescribes Cordials, Anodynes, and a convenient course of diet. The same forms of Medicines for the most part are expedient here, which were prescrib'd for an Empyema after incision, and also the same diet as was ordain'd in a beginning Consumption; besides, in this case Asles-milk often-times doth much good. As to the curing of this disease, I have observed, that an Issue made in the side, for the most part doth signally profit. I remember two suffering under this distemper, by coughing up plentifully mere stinking Pus or Corruption after the Imposthume broke, to have been heal'd by this Remedy in a short space of time. The Historie of the Cures shall be afterwards annexed. In both these by a shallow orifice made in the side by incision, meer Pus began within three or four days to flow out, and then the Spittle began to be abated; and after that flowing, encreased from day to day, for some time continued, the Spittle altogether ceased, and the Patient recovered his entire health.

Fontinels in the side very often greatly help in this disease.

The reason of this admirable Effect seems to be, that the part affected of the Lungs, or that which is bordering upon it, while the disease was arising, or before, grew to the very side, and therefore Nature had endeavoured by this way the thrusting forth of the Pus or matter contained in the Imposthume; and for that cause perhaps had made secret passages even to the superficies of the side; wherefore, afterwards an issue being laid open by a knife, the excretion of the morbid matter was conducted thither. It is also probable, that a certain part of the Lobe of the Lungs at first grew to the side in the diseased, and by reason of the cleaving thereto, afterwards the Imposthume had its arise; for whereas the part being almost immoveable, could not be stirred like to the other parts of the Lungs, the morbid matter was deposited there, and was the better able to reside or form its nest there.

Although the Imposthume of the Lungs be thought a very rare distemper with some Physicians, and by *Tulpius* judg'd so mortal, that when it breaks it kills out-right; yet I have known many to have labour'd under this disease, and by the help of Medicines to have recovered their pristine health. We may here describe two or three of the more remarkable Histories of them.

A Gentleman of a middle age, and before strong and continually healthful, finding himself not well, without any apparent cause, contracted as it were a crazie disposition; for being without Pain, without Vomit, Cough or notable Fever, in a short time grown weak, he became without any appetite unapt to sleep, full of thirst and hot about the Precordia; this person was handled a long while by some Physicians as Scorbutical, and by others as hectical; and after various methods of healing were assay'd in vain, at length the disease falling out as from an ambush, appeared manifestly. For whilst on a certain night being more unquiet than usual, he tossed himself very much in his bed, all on a sudden the Imposthume breaking in his Lungs, a large quantity of stinking Pus was thrown out by Cough, so that in four or five hours he threw off about two pints. Moreover, after his Cough continuing about two months, he daily spit out purulent matter, thick and very stinking, untill his flesh being consumed, and he wholly spent, was reduced to languishing, and a notable Consumption. From the stench of his Spittle and breath the whole Chamber was so filled, that his Servants or those attending him, could not endure the ill scent thereof.

After the Imposthume was thus broken, I and two other well-known Physicians being advised with, with all circumspection we prescribed Medicines to absterge and heal the Imposthume, and to cleanse the Blood and Lungs, and redeem him from an imminent Consumption. A Tincture, and syrup of Sulphur, together with Pectoral and Vulnerary Decoctions and Distillations were taken; also Loboche and balsamick Pills, day after day in a constant course, with Clysters, gentle Purgatives and Diureticks, were taken be-

ween

tween whiles : then these, *Vaporations and Fumigations, as well sulphureous as arsenical,* were used morning and evening. After these things being long and carefully used did help nothing, I often propounded the opening of the Thorax ; but the sick man obstinately rejecting this operation, said he would rather dye than be murdered ; yet at length, when I assured him that this remedy, or none, was further to be attempted, he began to deliberate with himself, and immediately baring his breast, he suffered me to search a place where I might apply a Cauterie ; the business was presently put out of doubt, for a Tumour appeared on the left side of the Sternum, between the 5th and 6th Vertebra. Instead of a Caution, I applied thereto a suppurating Plaister, and within three days the top of that swelling became red and soft : out of which, being the next day opened, first a thin ichor, and a little after a yellow and concocted Pus flowed out, and afterwards it continued daily to stream out more plentifully : from that time his stinking Spittle began to abate, and within fourteen days it ceased quite ; the morbid matter obtaining through that orifice both an easie and more convenient issue. Although by the effect it was manifest, that the passage of that orifice lay open into the breast, and perhaps into the middle of the Lungs, yet no liquor cast in by a Syringe, could either penetrate or be forced in thither : so secret and intricate are the conveyances which Nature forms for her last aids, that by the same passage by which the morbid matter is exterminated, nothing more hurtful can enter. This opening of the side was at length chang'd into an Issue, and a Pease or a wooden pill being put in, there came forth daily for half a year together plentiful ichor ; and in the mean time this well-known person, all corruption of the breast being shook off, and the fleshy habit of his body being recovered, became healthful in all respects ; and lastly, that issue being removed to his arm, he bears no sign of that nor any other disease in his breast.

After this Cure so by chance accomplished, it hapned I performed another like it, on purpose, not less successfully ; for shortly I was sent for to a noble Lady which had been for many years obnoxious to the heat of the Precordia with a Cough. One day, when she coughed she was thoroughly sensible of something broke in her Lungs, and presently she voided abundance of meer Pus, and that stinking ; after that, this kind of Spittle continuing with a Cough, for a week, notwithstanding the use of remedies, seemed rather augmented than diminished, I advised to have an Issue cut in her side, near the very place whence she perceived the Pus to ascend, which she readily granted. Within three days, from the orifice being opened meer Pus began to flow out, like that she discharged by Cough. Then after the morbid matter had issued out by that Fontinel, both the Cough and the Spitting of Pus wholly ceased, and within a Fortnight the Patient recovered her firm health.

After this I was sent for to another, *viz.* a strong man, and as strong a drinker ; who being affected with an Imposthume of the Lungs, also spit up an abundance of Pus and very stinking matter. This Patient by a certain rude contumacy abhorred any Issue, wherefore he would not suffer any to be made in his side ; notwithstanding he took any Medicines offered to him, by a long use of which Remedies he escaped free from that disease : the Medicines whereby he chiefly received help were prepared of Sulphur, as our Syrup and Tincture, taken daily and very frequently. To these for Vehicles were added one while a Decoction, another while a pectoral Hydromel, another while Lime-water, with an infusion of pectoral, as well as vulnerary Ingredients. Moreover Fumigations and Smoaks, especially of sulphureous and arsenical Ingredients, did contribute very notable help.

P H A R.

Part. II.

SECT. I. CHAP. XII.

Of an Asthma.

An Asthma a
most terrible
disease.

AMong the Diseases whereby the Region of the breast is wont to be infested, if you regard their tyranny and cruelty, an Asthma (which sometimes by reason of a peculiar symptome is denominated likewise an Orthopnoea) doth not deserve the last place; for there is scarce any thing more sharp and terrible than the fits hereof, the organs of breathing, and the Precordia themselves, which are the foundations and Pillars of Life, are shaken by this disease, as by an Earthquake, and so totter, that nothing less than the ruine of the whole animal Fabrick seems to be threatned; for breathing, whereby we chiefly live, is very much hindred by the assault of this disease, and is in danger, or runs the risque of being quite taken away.

An Asthma is denominated from *ἀσπναισιν* (which is to breathe purfie, or difficultly) and may have this description, that it is a difficult, frequent, and purfie breathing with a great shaking of the breast, and for the most part without any Fever.

The causes of re-
spiration hurt.

The act of breathing depends as well on moving the Lungs, the Structure whereof ought to be of that sort that its passages, and all the pores may perpetually be open, for the free sucking in and letting out air; as from the parts or organs moving them, which by alternate turns of Systole and Diastole, do cause the hollowness of the breast, and consequently of the Lungs themselves to be dilated, and contracted: whereas therefore there are many and divers reasons of disturbance, whereby respiration is prejudiced, for the most part they may all be reduced to these two heads; *viz.* that there is a fault either in moving the Lungs or in the parts or Instruments that ought to move them, and from hence the differences and kinds of this disease are best of all design'd; for according to the various nature and position of the morbid cause, it is called an Asthma, either meerly Pneumonick, proceeding altogether from the passages bringing in air being obstructed, or not enough open; or it is meerly convulsive, which only arises by reason of a defect or fault in the motive organs; or mixt, when either parts conspire in the fault, which origine every great and inveterate Asthma is wont to have; of each of these we will treat in order.

The Ancients
allowed the
cause of it only
from the Bron-
chia obstructed.

Or vapors from
the Spleen or
Womb, but er-
roneously.

1. The ancient Physicians, and for the most part hitherto the Moderns have only acknowledged the first kind of Asthma, judging the next cause, and almost the only cause of this Disease, to be the straitness of the Bronchia, *viz.* inasmuch as the spaces of those passages, being either straitned together by obstruction, or compression, as often as the use of breathing is required, do not admit of plenty enough of Air, wherefore, for the more free inspiration of air, as shall be needful, the organs of breathing do most difficultly labour, with throes most frequently repeated. But that some are found obnoxious to fits of an Asthma, without manifest taint of the Lungs, it was wont to be ascribed to vapours from the Spleen, Womb, Mesentery, or some other bowel, undeservedly enough; but surely that passion, without the straitness of the Bronchia, or fault of those bowels we have in another place sufficiently evidenced to arise from Cramps of the moving parts, and shall be presently clearly made out. But in the mean time by what means it may arise also from the passages of the Trachea, obstructed, or compressed, it lyes upon me to declare.

After what
manner the
straitness of the
Bronchia arises.

The straitness of the Bronchia, inducing the first kind of an Asthma, is supposed to come to pass by an obstruction, as often as either thick humours and viscous, or purulent matter of blood extravasated, are forced in upon them; or that little swellings as Schirrus's or little Stones, stop up their passages; or finally that a Catarrh of a serous humour suddenly distils upon them. Moreover the same distemper is thought to be raised by compression, as often as matter of that kind (and of every kind of them) shall cleave to the passages of the Pneumonic Arterie or Vein. Surely, an Asthmatical disposition depends upon these various causes and manners of disturbance: but all invasions of the disease, or at least the greater fits are usually provoked by reason of some accidents or occasions. For while the stream of blood sliding and running down gently can be content with a small breathing, it passes through the Precordia without great labour either of Lungs or Breast. But being boyling and passing through the Lungs more impetuously, it requires a more full inspiration of air; for the freer admittance of this through strait passages presently all the breathing organs are alarmed into most frequent throes. Whatsoever therefore makes the blood

to boyl, or raises it into an effervescence, as violent motion of the body or mind, excess of extern cold or heat, the drinking of Wine, Venery, yea sometimes meer heat of the Bed doth cause Asthmatical assaults to such as are predisposed. It is usual that those who are obnoxious to this disease oftentimes dare not enter into a Bed, only sleep in a Chair, or on a Bed, being covered with garments. The reason whereof is, that the body covered and heated with Bed-cloaths, the blood being a little raised into a more quick motion, and grown hot, requires a more plentiful sucking in of Air than may be supplied from the passages of the Trachea being straitned: for the more blood passes the Lungs each Systole and Diastole, by so much, for the enkindling and eventilation thereof, the Air ought to be more plentifully and quickly brought in and sent forth: to which task (when by reason of the impediments it is not easily dispatched) yet in some manner to be performed, the ultimate endeavors of all the parts appointed for breathing are made use of with a great contention of the whole breast. Moreover the blood being stirr'd, is not only an occasion, but also in some part a cause in those that are Asthmatically predisposed; for the vessels bringing blood being thereby mere fill'd and distended within the Lungs, compress the Tracheal passages being already very strait, and render them much more close.

II. A convulsive Asthma (which we judged to be the second kind of this disease, and to be raised without any great obstruction or compression of the Bronchia; from the mere Cramps of the moving fibres) is not limited to one place, or to any peculiar organ, but being of a diffused energy, it is extended to almost all the parts employed in breathing (whereof one while this, another while that, or some other is in fault.) For a Convulsive affection inciting an Asthmatical invasion, hath regard to the moving fibres of the vessels of the Lungs, to the Diaphragma, to the muscles of the breast, to the Nerves, which belong unto the Breast, or Lungs, nay to the origine of those Nerves planted within the Brain; and whilst the morbid matter dwells in every of these places, hindring or perverting the work of breathing, it brings on the fits of this Disease, as in another Tract we have somewhile since plainly demonstrated. For the animal Spirits destin'd to the Function of breathing, if at any time they are very much molested and constrained into irregular motions, enter inordinately into the Fibres as well nervous as moving of the organs of breathing, and make them for that cause one while to be contracted, another while to be distended irregularly, as also their solemn and equal turns of Systole and Diastole to be variously disturbed or hindered.

The morbid cause or matter provoking the Spirits prepared for the Pneumonic work, as in divers places, so chiefly in these three, is wont to advance its force or power, viz. 1. Either in the muscular Fibres themselves, or 2. In the branches or nervous slips, or lastly within the Brain by the Origine of the Nerves.

1. As to the former, the heterogeneous matter being inimical to the Spirits, is sometimes shaken off from the Brain into the trunks of the Nerves, and from thence by their passages and slips, if perhaps it shall be in very little quantity, without very great or sensible hurt slides down to their lower ends. And when it falls in the nervous Fibres, and being heaped up daily, shall at length sensibly increase into a great quantity, it begins to trouble the inmate Spirits, and provoke them into Asthmatical Convulsions; which forthwith infest, and are increased by reason of evident causes, neither do they utterly cease, until the stock of matter so accumulated, be wholly dispers'd, and consumed; afterwards when it being renewed arises to a fulness, the fits of that disease return, and are for that cause most frequently periodical, as is manifest to common observation. According to this account we do deservedly suspect the cause of a Convulsive Asthma sometimes to lurk in the muscular coats of the Pneumonic vessels, also sometimes in the Fibres of the Diaphragma, or the Processes thereof towards the loyns. It is not very probable that the nest of this disease consists within the Fibres of this or that pectoral muscle, although in Scorbutical persons from these also possessed with a Convulsive matter, we have known pains to have risen with breathing being hurt.

2. But truly (even as in another place we have not only demonstrated by reason, but by the Observations and Histories of the sick) a Convulsive Asthma is often incurred, as often as the morbid matter sliding down into the Pneumonic Nerves, sticks in some place within their passages, and especially about their foldings: whence as often as it is accumulated to a plenitude it begins to be mov'd and shaken; wherefore the spirits lying lurking, and flowing into the Organs of breathing disturbed, are forced into irregularity, and those spirits presently affect other inmates of the Fibres of the Lungs and breast, and provoke them into unequal and Asthmatical Convulsions. For this cause and the reason of the disturbance, we have declared that not only

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Whatever causes an effervescence of the blood is the evident cause of an Asthma. Why Asthmatical Persons are worse in Bed.

A Convulsive Asthma.

Its Seat manifested and diffused.

The morbid matter consists in several places.

1. In the muscular Fibres.

2. Within the Nerves and their enfoldings.

P H A R. invasions of this disease, but also the Precordia being disturb'd thereby the Cardiack
Part. II. passions do arise.

3. Near the Origines of the Nerves.

3. We have clearly unfolded by anatomical observations that the cause of a convulsive Asthma sometimes consists in the hinder part of the Head near the Origines of the Nerves. Surely I have observ'd some Patients, who when, lying sick of other desperate diseases, they were also Asthmatick, found it necessary to be whether in bed or chair with their head always erect, or looking down, but lying on their back or leaning backwards incontinently they gaped for breath as if they were dying, and hardly breathed; the cause whereof (as appear'd by dissection after they were dead) was only a huge collection of sharp Serum which was gather'd within the cavities of the brain; which, if by reason of the head inclining backwards, it fell into the origine of the Nerves of the eighth pair, presently the Precordia, and chiefly the breathing organs were affected with horrid cramps. Moreover sometimes for this very reason it seems that Orthopnoick persons cannot lie down in their bed without danger of choaking, but are constrain'd to sit up with an erect body.

3. A mixt Asthma or partly Pneumonic and partly Convulsive.

III. Although an Asthma is sometimes simple from the beginning, viz. either meerly Pneumonical, or Convulsive, notwithstanding after either disease hath for some time encreased, for the most part it gains the other to it self: hence it may be concluded every inveterate Asthma to be a mixt affection, stirr'd up by the default partly of the Lungs ill-fram'd, and partly by default of the Nerves and nervous Fibres appertaining to the breathing parts. For when the Pneumonic passages being straitned or obstructed from some cause, do not admit of a free sucking in, and breathing out of the air, for that cause also the blood, yea and nervous humour, being hindred in their courses, and compell'd to proceed slowly and to stagnate, do fasten their feculency and dregs upon the nervous parts; whence the passages of the spirits are obstructed, or perverted, and at length a Convulsive taint accrues to them. Moreover the blood, being not duly inspir'd and eventilated within the Precordia, at length being vitiated in its temperament supplies the brain and nervous stock but with a depraved juice, whose faults do chiefly punish the Organs of respiration before hurt and debilitated. In like manner also the evil is reciprocated on the contrary part, as oft as this disease begins by fault of the nervous stock; for as much as the motion of the Lungs is often stoppt or hindred, by reason or Convulsions in the muscular fibres, both the blood and the nervous juice being restrain'd from their usual motions, do heap up dregs and filths, fastening them to the parts containing them, by which not only viscous humours and obstructing of the passages, but even Tumours and other more solid concretes vitiating the structure of the Lungs, are produced.

The causes of an Asthma recided.

Therefore if when an Asthma being for some time confirmed and become habitual, shall attain to frequent fits, and those emergent upon every occasion; the conjunct cause thereof, and also the Procuring cause is placed as well inwardly in the Lung it self, as outwardly in the Fibres and Nerves, and in the spirits imploy'd for the function of breathing. Neither will it be difficult, by seeking diligently each of these things, to find in any case of the Patient, as well the chief nests, as nourishment of this morbidick matter. But as to the evident causes they are very many, and also of diverse sorts. For hitherto ought to be referred whatsoever move, either the blood and the other humours, or trouble the animal spirits and force them into irregularities. Asthmatick persons can indure nothing violent, or unaccustomed: from excess of cold, or heat, from any vehement motion of body or mind, by any great change of Air, or of the year, or from the slightest errors about the things not natural, yea from a thousand other occasions they fall into fits of difficult breathing.

The Prognosticks of the Disease.

As to the Prognostick part, an inveterate Asthma is difficultly or scarce ever cured; notwithstanding the medicines and method of healing being rightly ordered, oftentimes great succour is afforded, viz. the fierceness of the fits is diminish'd, longer respites are procured, yea, even the dangers of life it self, seeming frequently to be imminent are removed.

The disease growing worse, either threatens a Consumption, or a Dropsie, or some drowzy, or convulsive affect; accordingly as the Serum by reason of perspiration being hindred, being more abundantly accumulated (because the sick cannot sleep enough in their beds) it is either fixed in the Lungs, or transferr'd into the habit of the body, or into the brain it self. For this very reason the diseased do find themselves better in Summer, when they breath more freely, than in Winter; likewise better in hot countries than in cold, the South or West-wind blowing, than the North or East.

Two chief Indications.

Of the curatory method of an Asthma there will be two chief Indications, or rather so many distinct methods of healing, viz. Curatory and preservatory. The first instructs

instructs what is to be perform'd in the fit it self, that the Patient may be delivered from present danger; the other by what out of the fit, we ought to endeavour the taking away the morbid cause, lest that distemper be repeated more often or more heavily.

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1. Therefore a fit urging, there will be two chief intentions of curing, viz. first that a more free breathing be procured; as well upon the account of air, as of the Lungs, at least so far as may suffice to support life; and secondly, that the organs of breathing may be withdrawn, and restrain'd, as soon as may be, from the Convulsions begun, and usually obstinately continuing.

What is to be done in the fit.

1. As to what respects the former, let the Patient be placed in an upright position of body, in a more open place, and pretty airy, free from Smoak and breath of by-standers; then let it be endeavour'd that the Lungs being made free from all obstruction, and inward oppression, and also external compression, may be able to draw and change the breath more easily. For these purposes lest the bulk of the nether bowels compress or straiten the Precordia, the belly is to be loosen'd by a Clyster, the apparel & what ever binds about the Breast to be loosened; also when in this case either from the blood swelling up inordinately within the Pneumonic vessels, or from the Serum distilling out of the Arteries and Glandules into the tracheal passages, they are wont to be oppressed, the impetuosity and instigations of either humour ought to be restrain'd and appeased; infomuch that if strength endure and the pulse be strong enough, Phlebotomy is oftentimes convenient. Moreover those things are carefully to be administred which dispatch away the Serum and superfluities of the boiling blood by urine, as well as sweatings: to which Intention, Juleps, Apozemes, commonly call'd Pectorals, do notably conduce; yea powders of shells, millepedes prepared, Spirits and volatile salts, are successfully used. In the mean time besides let there be administred whatsoever opens and makes slippery the passages of the Trachea, and moves expectoration, and whatsoever, if need be, gives stop to a Catarrh distilling upon the same; for which purposes, Lambitives, Lohochs, pectoral Decoctions and suffumigations are good.

1. Intention to facilitate breathing.

2. As to the other intention of curing in these Convulsive fits, viz. that the organs of breathing may be restrained from the Convulsions begun, and may quietly return to their ordinary task, (unless this succeeds of its own accord, after the boiling of the blood and Serum in the Lungs be appeased) we must use Antispasmodicks or remedies against Convulsions, and Anodynes: for medicines which are used to be administred in hysterical passions, do conduce in a convulsive Asthma.

2 Intention to free from Convulsions the moving parts. Remedies which dissipate the Spirit profit for this end.

Spirit of Harts-horn, of foot, and especially of sal Armoniac distill'd with gum Ammoniacum; also the tinctures of gum Ammoniacum, of Sulphur, of Castor, of Asa fetida, Syrups of Ammoniacum, Sulphur; Oxymel of squils and such like, which because they are of an ingrateful tast or smell, as it were dissipate the spirits and withdraw them from tumults, do sometimes help notably. But if the spirits being outrageous cannot by this means be appeased, we must assay Narcotics, that some of them being subdued the others may be reduced to order: for surely unless a stuffing up of the Lungs, with a great oppression of the Precordia do hinder, Opiates do sometimes greatly profit. In the dreadful fits of this disease, when other medicines had effected less, I have often administred successfully Diacodium, as also Laudanum Tartariz'd. But these may not be exhibited without great circumspection, because whereas more or less they hinder breathing (which already is difficult and too much hindred) they frequently bring the Patient into danger of life. Besides this, that the Pneumonic spirits may be diverted from their Convulsions, it is many times expedient to molest the spirits in other places; for some of the spirits being in other places afflicted most commonly the residue as well as those that are smitten do dismiss their irregularities. Wherefore Vescatories, Cupping-glasses, ligatures, and painful frictions bring help; also for this reason vomits are successfully taken in the midst of a fit. The scope of healing being now design'd, after what manner the Patients in an urging fit of an Asthma ought to be handled, it yet remains for us to propound some more select forms of Remedies appropriated to the same ends.

Or do bring them asleep.

In the first place therefore to give a stop to the flux of blood and serum, and to dismiss their superfluities deriv'd from the Lungs by sweat and urine, these ensuing are prescrib'd.

Forms of Remedies.

Take the water of ground-Ivy eight ounces, of Rue, Pennyroyal, Dragons, of each two ounces, of sal pruniella one dram and a half, Syrup Byzantinus, red Poppies of each one ounce; make a Julep, take it three or more times in a day, the dose three or four ounces. An Apozeme.

Take grass roots three ounces, roots of Kneeholm two ounces, candid Enula-campane one ounce

P H A R. ounce and a half, barley half an ounce, Raisons of the Sun, one ounce, boyl them in three pound of water to two pound, adding to your strain'd liquor sal prunella one dram and a half; sweeten it, if there be occasion, with Syrup Byzantinus or of Violets.

Part. II. *A Tincture.* Take tincture of Sulphur three drams, the Dose six drops to ten, evening and morning in a spoonful of Syrup of the juice of ground-Ivy, or Violets.

A Powder. Take of facula of Aron and Briory, of each one dram and a half, flower of Sulphur one dram, flowers of Benzoin half a dram, Sugar-candy half an ounce, Liquorish two drams; make a powder to be taken to half a dram or two scruples twice in a day with the former Julep or Apozeme: Or,

Mixtures. Take of the powder prescribed two ounces, honey or Oxytel what will suffice, make a Linctus, take about half a spoonful evening, and morning, and at other times lick it with a stick of Liquorish.

Take Syrup of Horehound, of Garlick of each one ounce and a half, tincture of Saffron, Castor, of each two drams, mix them, take a small spoonful in the fits.

Take of spirit of sal Armoniac with gum Ammoniacum three drams, of snail water, and of Earth-worms of each three ounces, Syrup of Horehound two ounces, mingle them, take by a spoonful once in four or five hours.

Take of the powder of Hedge-mustard, or of ground Ivy gather'd in the heat of the Sun one ounce, of Oxytel simple enough to make a Linctus.

2 The Indication preservative proposes what is to be done out of the fit.

Suggests two Intentions of healing.

2. So much concerning the method, and medicines requisite in the fit of an Asthma. The other indication preservative designing the taking away of the whole procuring causes and the morbid matter contains two parts or distinct scopes of cure: both which for the most part are wont in the practice to be complicated and administered together. One of these endeavours to amend the conformation of the Lungs, if it be any way hurt or faulty, and the other to take off the irregularities of the moving parts and spirits, appointed for them. We shall best answer both these intentions if the remedies vulgarly call'd pectorals, are mixt with anticonvulsives, and the use of these with other medicines respecting the preparation of the whole body and emergent symptoms be apply'd between whiles. For which purposes the method and ensuing forms of remedies may be administered.

Forms of Remedies.

Take of Aloes rosata a dram and half, flower of Sulphur a dram, salt of Amber half a dram, Tar what will suffice, make 24 pills, take 4 every, or every other, or every third night: Or,

Pills.

Take of gum Ammoniacum, Bdellium dissolv'd in vinegar of squils of each half an ounce, flower of Brimstone three drams, powder of hedge-mustard and savory of each half a dram, make a mass with Syrup of Sulphur or Oxytel of squils; make small pills, take 3 every evening: Or

Take Hog-lice prepar'd two drams, flower of Benzoin half a dram, salt of Amber two scruples, extract of Enula-campane half a dram, Castor half a dram, Saffron a scruple, Venice Turpentine enough to make a mass, form small pills, take 4 every evening and morning except at the times of purging.

But if this form of Pills will not please, or the above mentioned Medicines profit little, afterwards the ensuing shall be essay'd to free the Lungs from obstruction.

Mixtures.

Take spirit of gum Ammoniacum distill'd with sal Armoniac three drams, the syrup of Ground-Ivy three ounces, magistral Snail and Earth-worm water of each an ounce, tincture of Saffron two drams, mingle them and take a spoonful evening and morning. Or,

Take Tincture of Ammoniacum three drams, the dose from 15 to 20 drops in a spoonful of Oxytel, or of syrup of Ground-Ivy. Or,

Take Tincture of Sulphur three drams, dose from 7 drops to 12 or 20 in a convenient vehicle at the same hours.

In like manner other spirits endued with a volatile salt, and mixt with pectoral Syrups and Cephalick waters, may be prescribed successfully evening and morning.

In place of a mixture or an Asthmatical Julep from distill'd-waters in the shops, let this following magistral be prepared for frequent and several uses.

A distill'd Water.

Take roots of Enula-campane, Orris of Florence, Angelica, Masterwort, of each four ounces, of Bryony a pound, the leaves of white Hore-bound, Hyssop, of Savory, Penny-royal, Ground-Ivy of each four handfuls, Juniper and Ivy-berries of each a pound, Bay-berries half a pound, sweet Fennel, Carue, Annis, Lovage, Dill-seeds of each an ounce, Cubebs two ounces, Long-pepper, Cloves, and Mace of each an ounce, all being sliced and bruised pour on them eight pound

pound of Brunswick Beer, distil it in common Organs, mix the whole, and as you use it sweeten it with Sugar, or Syrup of Ground-Ivy, or with Oxymel. PHAR. Part. II.

Moreover in lieu of Oxymel, or any common pectoral Syrups, the ensuing forms of Medicines appropriated to an Asthma are prescribed; and in the first place the Syrup of Enula-campane invented by *Horatius Augenus* and called by his name, and afterwards commended by *Platerus*, *Sennertus*, *Riverius* and other renowned Practitioners, ought to be observed in this place, and used frequently.

Take of Enula-campane, Polypodie of the Oak prepared of each two ounces, Currance two ounces, *Sebestens* 15, Colts-foot, Lungwort, Savory, Calaminth, of each a handful, a large leaf of Tobacco, Liquorish two drams, Nettle and Silk-worm seeds of each a dram and a half, boyl them in Wine mingled with Hony and diluted to a pound and half, and with a little Sugar make a Syrup: take it by it self in form of a Linctus or a spoonful evening and morning, or add a spoonful to the distilled water or Apozeme. *Magistral Syrups.*

Take Florence Orris-roots, Enula-campane of each half an ounce, Garlick peel'd four drams, Cloves two drams, white Benozin a dram and half, Saffron a scruple, slice and bruise them and digest them warm in a pound of rectified spirit of Wine for 48 hours; to it strained add fine Sugar a pound, put it in a Silver Bason upon live coals, stirring it till it flame, and let it burn as long as it will, then the flame being out make a Syrup of it to be taken as the former.

Moreover hither may be referred the decoction of an old Cock so much magnified by renowned Physicians as well Ancient as Modern, for the cure of an Asthma; which although *Septalius* damn'd for gross and of no efficacy, notwithstanding *Riverius* after him vindicates; and to attest the efficacy of this remedy opposes his own experience to the others. These broths are of two kinds, viz. either with or without purgers; and various Recipes of each do remain in practical Authors, all which would be tedious to recount here, we shall propose one or two forms.

This is the common example without purgers.

Take of Orris and Enula-campane-roots of each half an ounce, Hyssop and Hore-bound dried of each six drams, Carthamus seeds an ounce, Annis and Dill seeds of each two drams, Liquorish scraped and Raisins stoned of each three drams; let them be prepared and sewed into the belly of an old Cock, which boyl in fifteen pound of water until the flesh depart from the bones, strain it and let it settle: of the clear liquor the dose six ounces, with an ounce of Oxymel simple. Or if the remedy be desired to be solutive, dissolve of fresh Cassia and Manna of each half an ounce in each draught, taken for many days together, and sometimes for a whole month.

Riverius prescribes a convenient form of such a kind of purging broth.

Take Enula-campane and Orris-roots of each a dram and a half, Hyssop and Colts-foot of each a handful, Liquorish and Raisins of each two drams, Figgs 4, Senna cleansed three drams, Polypodie of the Oak and Carthamus-seeds of each half an ounce, Anniseeds a dram and a half, boyl them with the third or fourth part of an old Cock, make broth for one dose to be taken in the morning, let them continue it for twelve or fifteen days.

Of many examples of Asthmaticks I shall propound only two singular ones, viz. *The first History* I will describe the History of one who hath been obnoxious to fits of this disease of a Convulsive Asthma, and of another partly Convulsive and partly Pneumonic. A Noble Person, proper and well set, and formerly healthful enough, after that by chance he had struck his side against some solid body, from that time contracted a hurt, and afterwards an Asthmatical taint. For we may suspect, a certain folding of the Nerves belonging to the Precordia placed near was prejudiced by that accident, and from such a cause afterwards this distemper derived its Origine, viz. at some incertain times the pain at first troubled him about that place, and presently a most painful Dyspnoea ensued with a laborious and lasting contention of all the breathing parts; infomuch that while the fit lasted the Patient was thought to be in the agonie of Death. I was first sent for to him after labouring for two days with such an invasion of the Asthma that he was accounted in a desperate condition; Notwithstanding finding his Lungs without hurt, our Prognostic willed as yet to hope well, and immediately by a Consultation of other Physicians it was prescribed as followeth.

Take of Spirit of Gum Ammoniacum distill'd with salt of Tartar three drams, take from *The Cure*

PHAR. 15 to 20 drops in a spoonful of the following Julep, drinking after it five spoonfuls, repeat it every sixth hour.

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Take elder flower, Camomile, and Pennyroyal water of each four ounces, Snail-water two ounces, Sugar one ounce, mingle them, between whiles he took a dose of the following powder with the same Julep or Pectoral decoction.

Take Powder of Crabs-Eyes two drams, sal Prunella a dram and a half, salt of Amber half a dram, mix them, divide it into eight doses.

Large vesicatories were applied on the inside of his arms near the Arm-pits, Clysters daily administred, and frequent frictions. By the use of these he received sudden and unexpected help, and within a few days became wholly free from that fit. Afterwards as often as he had any preception of the first motions of this disease, presently he took a large dose of that Spirit with the same Julep 3 or 4 times aday, by which remedy often used, one while for preservation, another while for the cure sake, he was void of any outrageous invasion from his habitual Asthma for above two years, in the mean while suffering some more light assaults but easily blown off.

The second History of a mixed disease.

A very Honourable old Gentleman dignified by many great Titles, himself being greater than all them, after that for some years he had liv'd every Winter obnoxious to a Cough and a moderate spitting, and gentle enough, at the end of the last Autumn returning from a long journey he was less healthful: (as it was thought by cold he had taken) for he complained of a pain in the middle of his breast next the sternon, which growing worse in an evening, as soon as warm in his bed, wholly disturbed his sleep, and most part of the night was very troublesome: notwithstanding without any Dyspnoea or evident sign of an Asthma. To take away this pain both Purgings and Bleeding were used, pectorals and antiscorbuticks were daily used, liniments or fomentations were applied to the place pained, yet without any great success or ease: for the alteration which happened afterwards declined rather to worse; for a difficult and obstructed breath came upon the pains growing a little more remiss, so that from his first sleep, or inclination thereto he became Asthmatical and gaping for breath, and suffering about the Precordia he was constrained to sit upright in his bed. Moreover a dyspnoea of this kind and a Convulsive agitation of the breathing parts did not only return every evening, but from day to day were rendred more outrageous and lasted a longer time; insomuch that one night waking from his sleep, for many hours he was assaulted with a most painful fit of an Asthma which had almost kill'd him. The Physicians being at a great distance from him, although desired about midnight came not while the morning following, mean while by reason of bleeding used by a Barber this worthy Gentleman revived, being redeemed from the jaws of death; but afterwards by the Consultations of the Physicians that day a slender diet and loosening the Belly by a Clyster were prescribed: In the evening and early in the morning he took of Spirit of gum Ammoniac distilled with sal Armoniac 12 drops in a proper vehicle, and continued the use for many days after; Vesicatories were applied on the inside of his Arms near the Arm-pits; moreover Juleps and Pectoral Decoctions, Lohochs, Clysters, and also mild Purges were taken by turns; also Phlebotomie was repeated after two days. Whereas formerly he was used to drink for his mornings draught a Pint of Ale with Worm-wood and Scurvy-grass, in the room of that about eight a Clock he took 15 drops of Elixir Proprietatis tartariz'd in a draught of Coffee made with Sage. By these remedies his Asthmatical fits presently abated of their fierceness, insomuch that the beginning and end of every night were quiet enough, but in the middle light troubles about the Precordia kept him from sleep, sitting upright an hour or two. Certain other Medicines were propounded by the Physicians, and others of diverse sorts privately offered by his friends, which notwithstanding the Honourable Person utterly rejected, or soon loath'd; and that the rather, because, Winter then being almost spent, his restauration was hoped for by the coming on of the Spring and enjoyment of the Country air without the help of much Physick. Wherefore of the Medicines above mentioned he used one while this and another while that a little by turns, and sometimes kept holy-day from them all; but in the interim although his Asthmatical invasions little or nothing troubled him as formerly in the night, yet by reason his Lungs were very much obstructed, and a serous humour fallen down into his feet, he was not able to walk fast or ascend steep places, without a painful dyspnoea, being in danger of choaking; and now (while I am writing this) not so much an Asthma or Consumption, as a Dropsie is feared.

The reason of this cause.

The Aetiology of this case is clearly enough manifest from the above mentioned things, viz. one procuring cause of this Asthma was a lung greatly obstructed, insomuch, that whereas the blood boiling, passed through the precordia more impetuously

impetuously, the air requisite for its ventilation could not be admitted in plenty enough; wherefore to supply this defect there was necessity that the Lungs and their motive organs should be provoked into more frequent, and more vehement throes. Afterwards from thence ensued a convulsive disposition of the fibres moving the breast: for the heterogeneous matter descending into those parts together with the nervous juice, and being gathered to a plenitude, first excited pain and afterwards fierce and periodical convulsions in the pneumonic organs: and now although this latter disposition cease (because the Elastick and spasmodical matter is blunted or extinguished by the serous illuvies) yet the other procuring cause still remains, and hath got another associate, viz. a worse Devil than it self, to wit a Dropsie.

SECT. I. CHAP. XIII.

Of a Dropsie of the Breast.

IT is clearly manifest by certain and manifold discoveries, that the Region of the Breast is sometimes affected with a Dropsie; for the sense and sound of water fluctuating, do most evidently demonstrate it in living bodies; and Anatomical inspection in the defunct. But yet concerning the cause of this Disease, and manner of coming to pass, to wit, by what ways, and after what manner disposed, the accumulation of water first begins within the hollow of the Breast, as also how it is sensibly augmented, and frequently insensibly continued until the Disease becomes desperate, is a thing yet in the dark. Whenas there is a general distemper of a Dropsie or an Anasarca appearing, and hath seized on the flesh and cavities, of the bowels every where, or in most places, we are not to admire if that illuvies of waters seize also upon the Pectorals: But besides, sometimes it happens, that the Region of the Thorax, is either first or only overflowed, the other parts in the mean time remaining sound enough, or only hurt secondarily.

A Dropsie of the Breast is easily known.

About the origine of this Disease, and the manner of generation it is much disputed whence, and by what passages that illuvies of water being found every where in the hollownes of the Thorax, doth come thither. Some Authors do derive it from above, viz. that it descends from the head by the Trachea; and others deducing its Spring from beneath, from the cavity of the Adbomen, also sometimes from the Liver and Spleen, by I know not what blind ways, judge those watersto be conveyed into the hollownes of the Breast. But neither of these Opinions challenge our assent, or deserve our arguments to disprove them: for none considering the passage of the blood and humours will acknowledge either this or that way of commerce. We cannot but affirm, that the serous humour, raising a Dropsie of the breast, does arrive thither either in a kind of vapour. which being exhal'd from the Precordia, and sides of the Thorax is easily condensed into water; or secondly, that the Serum is there deposited under its own proper form, inasmuch as it flows into that cavity from the mouths of the Vessels, &c. of the Arteries being open. We will anon enquire whether the Lymphaducts or vessels bringing chyle, being any where open, or broke, do sometimes produce that disease.

Its cause is hidden.

How many wayes it may be produced.

1. As to the former, it is so very probable that a Dropsie of the breast takes sometimes its origine from vapours condensed within its cavity, that it is a wonder how it should be otherwise at any time, or that any should live exempt from such an effect. For how much is there of vapour, that separates from the boyling blood? and when it waxes cold in the precordia, how can it come otherwise to pass but that the abundant vapour should be condensed in this enclosure into water, even as if shut within a Still? And truly it will not be easie to determine, when the vaporious steams are so incessantly heaped within the cavity of the breast; what may become of them, how they are consumed, or from thence discharged abroad. Surely we must affirm, they either penetrate the sides of the Thorax, or (which rather seems to be) they insinuate into the pores of the Lungs, and so fly away in breathing. Certainly by either way, the vapours of the breast may exhale: and perhaps if either be defective, or hindered, by that means a Dropsie of the Breast may be caused.

1. By Vapours condensed there.

2. But moreover, I am apt to think, that this Disease also sometimes happens in another manner (inasmuch as the Serum distills from the vessels in its proper form.) For in a caochymical constitution of body, or a person very scorbutical, where the watery

2. By Serum deposited there.

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Which sometimes break out from the Arteries.

3. And sometimes from the Lympheducts.

A remarkable history of the like case.

The reason thereof.

The Cure by a Paracentesis of the breast.

watery and weak blood every where casts off its superfluous Serum from its own consistence, and every where ejecting it from the little mouths of the Arteries being loosed and open, excludes it from the clew of circulation, nothing is more usual, than for the cavities not only of the Bowels, but also of the Precordia, yea the Brain it self, to be overflowed with that watery collection; moreover in so general a disposition to a Dropsie, that one while this region, another while that, or another should be first and almost onely possess'd; and that also sometimes the inmost parts being untoucht, the outward flesh, viz, the muscles and their interspaces are overflowed with that ferous illuvies.

3. Among the vessels that pour in the dropfical matter into the cavity of the breast, the Lympheducts and parts bringing the chyle, do justly fall under a suspicion. What relates to the former, it appears by anatomical inspection, that a great company of these do creep through the whole Lungs, and do tend from their outer parts, stretching out themselves inwards towards the passages of the breast, and for the most part pour out into them their liquour, which being superfluous, they every where suck up from the arterious Blood. Therefore whenas these vessels are obstructed, or are by any means impeded from discharging their function, it must needs be that a heap of water be accumulated in the Lungs, which afterwards falling into the cavity of the breast, will excise a Dropsie in that region. For in truth, this Lympha restagnating within the consistence of the Lungs, it often happens that the little bladders called Hydatides, in the outer superficies of the Viscera are raised up, which afterwards being broke, discharging the waters into the cavities of the Thorax, they produce there an Ascites. A distemper of this kind is often discovered in Sheep, when they dy by heaps of a Dropsie, by reason of a moist season and watery pasture. And surely the following History doth clearly seem to argue, that the Ascites of the breast proceeds from the like cause sometimes in a man, (there being yet a living example of this disease.) Lately a young man healthful enough and strong, having accustomed himself to hunting and insatiable riding, and other exercises of the body very immoderate, a while without detriment, at length he perceived a fulness in his Thorax as if it were a kind of swelling; inso much that the left side of his Lungs seem'd to begin to swell, and his heart to be thrust out of its place towards the right side, for that he perceived the pulsation thereof to be on that part chiefly. After he had been for some time in this condition, on a certain day he felt as if a vessel had been burst asunder within the cavity of the Thorax, and from thence for the space of half an hour, in that place, as it were the dropping of a humour falling from above into the bottom of his breast, was not only felt by himself, but could be heard also by the standers by. Although he was at first surprized with the rarity of this affect, yet for that he was well enough as to strength, appetite, sleep, and other natural functions, immediately after he became secure, and negligent of Medicines; But afterwards by any motion, bending or stirring of his Body, a fluctuation of water gathered within on his left side, was felt by him; moreover, the motion and sound was evidently perceived by others, either by handling, or by the ear. As without doubt this Gentleman was affected with a Dropsie of the Breast, so it seemed most probable that the disease had its original from thence, in regard the lympheducts relating to the left side of the Lungs, being first obstructed near their insertions into the passage bringing the chyle, did swell up to a great bulk, and afterwards being broken distill'd their humour into the cavity of the Thorax.

When now an Inundation of the Precordia, and so of the vital Fort, was imminent, this Gentleman at length, thinking it time to provide for himself, entered into a course of Physick, and carried certain Medicines into the Countrey for his cure, yet without any signal success. Afterwards coming to London, he first consulted the worthy Dr. Lower, being of his former acquaintance. He proposing the opening of the Thorax for his only remedy, took care that the worthy Dr. Micklethwait and my self should be sent for to the consultation. Immediately an incision was appointed by the consent of us all: wherefore, after provision for the whole being made, a Chirurgeon applyed a Cautey between the sixth and seventh Vertebra, and the next day he put his Pipe into the Orifice cut into the cavity of his Breast; which being done, immediately a thick liquor whitish like Chyle, and as it were milkie, flowed out. There was about six ounces only taken from him the first time, and the next day as much more. The third day when a little greater quantity was suffered to come out, being affected immediately with great fainting, and afterwards being feaverish, he was ill for a day or two. Wherefore it seemed good to stop the issue of that matter till he recovered his temperament and strength: but afterwards a sparing Evacuation of the same matter being daily made, the cavity of his Breast was wholly emptied: but as yet he wears a pipe in the orifice with a tap, which being opened once in a day and a nights space,

a very little of the humour flows out; in the mean while, being well in stomach, visage, and strength, he walks abroad, rides, and performs all exercises he was formerly accustomed to, vigorously enough. He used not (neither was there need of) much medicine, only after the Incision we advised temperate Cordials, *viz.* powder of Pearles, Juleps, and sometimes Hypnoticks, and afterwards a vulnerary decoction to be taken twice aday.

By this method, and these forms of Medicines sometime continued, this worthy person seemed to recover his temper, and his strength, and the habit of his Body, and his breast exempt from the Dropsie. Notwithstanding he still wore a silver Pipe in the orifice of his side (out of which ichor daily flowed): and when after some months this being withdrawn, the Issue was shut up, a gathering of the same humour was made within the hollow of his Breast, perceivable by the found and fluctuation thereof: but when that the disease returning, the same medicine was to be used, and incision of his side appointed, (Nature by chance discharging the function of a Chirurgeon) the matter being prone to burst out, and flowing to the place made its own way. He is now necessitated (for preventing the illuvis of his Breast) to keep that orifice constantly open like a sink.

From these things I think it manifest enough, that an Ascites of the Breast, sometimes arises from the lymphatick vessels burst asunder within the Lungs; neither doubt I less but that the same affection may be caused from the Chiliferous passages being broke within the Thorax; notwithstanding, this chance so rarely happens, that as yet I have not known it by my own observation, or others relation. Moreover, it little avails to make inquisition into the *Ætiologie* of such a disease, because it is not only apparently incurable, but in a short time mortal; because the Precordia are incontinently overflowed by the inundation of the chyle, and also the blood and the animal spirits being defrauded of their wonted supply of nutritious Juice, are immediately dissolved.

From the various causes of this Disease even now set down, it will be easie to collect its differences: For first a Dropsie of the Breast, is either simple and primary, peculiar to this Region; or secondary, coming upon a general Dropsie, as it is wont often to be in cachectic persons. Secondly, this Disease is distinguished as to the places affected, *viz.* forasmuch as water is either collected in the whole breast, or only in one side thereof. Thirdly, as to the matter accumulated in a pectoral Ascites, which one while is limpid and plainly waterish, another while more thick, whitish, and as it were milkie, such as we have described in the foregoing History.

The diagnostic signs do manifestly enough discover this disease: *viz.* the fluctuation of water is perceived by handling, and by feeling at every bending of the body, and the sound is clearly heard. Moreover they are affected much with a dry and empty Cough, as also with a Dispnoea almost continual and painful, especially while they ascend steep places; Besides, they have a thirst, with a feaver, and in the night after the first sleep, great disquiet and tossing of the body, proceeding from the vapours being elevated by the heat being more intense. Sometimes there comes upon these a Palpitation of the heart, an intermitting or disturbed Pulse, and frequent faintings of the spiritale. As to the Prognostick, this disease is always difficult to cure, and among the vulgar accounted incurable. And surely if it come upon an Ascites of the Abdomen or an Anasarca throughout the whole body, it is judged not without cause desperate; But if the affection be primary, and happen to a body otherwise sound, we are not altogether to despair of Cure.

What relates to the curatory part of this Disease, the chief Indications will be three, Curative, Preservative, and Vital, according to the common method of curing in most other Distempers.

The first has regard that the water heaped up in the cavity of the Breast by any means be evacuated. The Second provides, that afterwards a new illuvis be not gathered in the same place. The Third procures the restoration of strength, and the symptoms impairing it to be removed with expedition.

To satisfy the first Indication, and that an Ascites of the Breast may be emptied, there are but two ways or means of evacuation to meet with, whereby this collection of waters may be drain'd, *viz.* Either that the vessels of the Breast, and the passages of the humours, being empty'd, might suck up that Lympha being rarified, and afterwards by the passages of the blood or air convey them forth: or secondly, that by an incision of the side, those waters may be drained forth plentifully in their own Species.

That former manner although more seldom, yet sometimes succeeds; which I can attest out of my own observation. For the consistence of the Lungs being spongy within

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The differences
of this disease.

The Diagnostic
signs.

The Cure.

What Intentions
of healing the
first Indication
suggests.

The first Inten-
tion.

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within, and externally very porous, while by every turn of the Diastole, they are drenched in the underlying waters, they sometimes imbibe them being turn'd into vapour; and so dispatch them to the blood, or continually exhale them with air coming out at the mouth. That an effect of this sort may more easily happen to cure this disease, medicinal aids are taken: For that intention therefore the passages of blood, air, and humours ought to be emptied as much as may be, and to be kept so empty. For this purpose, Purges, Diureticks, and more mild Diaphoreticks are methodically, and alternately exhibited; also remedies for the breast, and expectorating, challenge here their place; let the Diet be slender and warming, and a government appointed as to all other things of that nature, that the blood may be made to exhale the more, and all the superfluous humours to evaporate. I think good to annex some forms of Medicines accommodated to these uses.

A Purging Hydromel.

Take of Chervil-roots, Knee-holme, Polypodie of the Oak, of each an ounce, Agrimony, white Maidenhair, Oak of Jerusalem, Ground-Ivy, of each one handful, Carthamus seeds one ounce, Florence Orris half an ounce, seeds of Danewort 3 drams, Calamus Aromaticus half an ounce, boyl them in four pound of Spring-water, to the Consumption of a third part, add to it being strained Senna one ounce and a half, Agarick two drams, Mechoacan and Turbith, of each half an ounce, yellow Sanders a dram and a half, Galangal the less one dram, boyl them two hours gently, and close covered, afterwards strain it and add of Honey two ounces, clarify it with the white of an Egge, make a purging Hydromel. The Dose is from six ounces to eight, in the morning, twice or thrice in a week. Or,

Take Mercurius Dulcis one scruple, Resine of Gallap half a scruple, Balsam of Peru what suffices to make four Pills, to be taken in the morning, and to be repeated within five or six days.

Tinctures.

Take Tincture of Sulphur three drams, take from seven drops to ten, at night and in the morning, in a Spoonful of the following mixture, drinking after it three Spoonfulls.

Julep.

Take of the water of Snails, Earth-worms, and compound Radish water, of each four ounces, water of Elder-berries fermented one pound, Syrup of Juice of Ground-Ivy two ounces, mix them for a Julep. Or,

Take of Tincture of Ammoniacum, or Galbanum, take twenty drops evening and morning in the same mixture. Or,

Pills.

Take of Hog-lie prepared two drams, flower of Sulphur two scruples, flower of Benzoin one scruple, powder of wild Carrot and Burdock-seeds, of each half a dram, Turpentine of Venice, enough to make a mass. Make small Pills. Take four evening and morning, drinking after them a small draught of the Julep.

A Lime-water.

At Nine a Clock in the Morning, and Five in the Afternoon, let him take four ounces of the Compound Lime-water, by it self, or with any other proper remedy.

A Bochet.

For ordinary drink take the following Bochete.

Take Sarsaparilla six ounces, China two ounces, white and yellow Sanders, of each six drams, shavings of Ivory and Hartshorn, of each three drams, Calamus Aromaticus half an ounce, Raisins half a pound, Liquorish three drams, boyl and infuse them in twelve pound of Spring-water to six pound, strain it.

A History of a Patient.

Formerly about twenty five years since, when I resided at Oxford, I was sent for to a young Scholar, who suffered for three weeks space under a pain of the Thorax, and a most grievous Dyspnea constantly troubling him in the evening, moreover, from a more quick motion of body, or going more hastily than usually up any steep place, he laboured extreamly, he could not lye down long on either side, but was necessitated to lye in his bed supine, and his head erect; if perhaps he attempted to lye on either side, immediately pain followed that position of body, and if perhaps he roll'd himself from one side to another, the pain being also presently translated, he felt as it were water to wave from place to place. Hence I had a just suspicion of a Dropſie of the Breast, whereof that I might be more assured, I order'd that lying upon his back on his bed, he would suffer his head to bend backward from the bed-side to the floor, immediately he had a plain perception of water running towards the Clavicles, together with a change of the pain thither. Moreover if at any time he grew more hot than usual, from motion, or in his bed, or by the fire, he presently felt sensibly in his breast, as it were water boiling over the fire, and also complained of a Vertigo, and a small decay of Spirits. Wherefore, when we might lawfully collect out of these things rightly considered, that he was affected with a dropſie of the breast, I prescribed the following method and medicines with success.

The Cure of him.

Take of Mercurius Dulcis fifteen grains, Resine of Gallap half a scruple, Syrup of Roses solutive what suffices, make three Pills. He took them early in the morning and had twelve stools with great ease; afterwards on the third day by the same Medicine he had but four;

but with greater benefit ; he took afterwards for many days six ounces of the Pectoral and Diuretick Apozeme twice in a day, and lastly repeating the Purge he perfectly recovered.

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SECT. II.

Of Splanchnick remedies, or those which respect the bowels of the lower Belly.

CHAP. I.

Of the Jaundies and the Remedies thereof, and the manner and reason of their operations.

Hitherto we have largely enough unfolded the Pathologie and curatory method of the Thorax ; now it follows next to finish our task in like manner about the lower Belly. But we have in our former Tract for the most part described already the medicines belonging to this region, and the manner and reasons of their working, together with the Anatomy of the Stomach and Intestines : we have treated of remedies stomachical, dysenterical, and others belonging to the intestines, as also diureticks together with the reasons of them : Moreover we have sufficiently elsewhere handled the ætiologie of Hypochondriack, and Hysterical remedies. What therefore remains, of Hepatical distempers as well proper, as of those vulgarly ascrib'd thereunto, and of their remedies, we will discourse in this Section ; notwithstanding in each of these, we will bestow more labour, about the curatory, than pathological part.

The chief diseases by which the Liver and the Appendix thereof, are wont to be incumbered, are the Jaundies, and a Tumour, and under this latter many other affects, viz. obstruction, inflammation, induration, and schirrus are numbred ; to all which are vulgarly appointed remedies commonly called Hepaticks, and which make up a great part of the Dispensatory.

Diseases of the Liver.

The Jaundies is either a disease by it self, primarily beginning, which is here properly treated of : or it is an effect or product of another disease ; as when it arises upon an intermitting Feaver, which oftentimes it puts an end to, of which also we will presently treat by the by.

An Icteric distemper by the common consent of most is judged to arise in as much as the yellow choler, not at all, or not enough received, from the ends of *vena porta*, into the passages of the cholerick pore, overflows into the mass of blood and polutes it with its greenness, whereby also the very skin is discolour'd.

The Jaundies.

That obstruction is wont to happen after many manners and in various places. For sometimes it happens near the extreame ends of either kind of vessels, viz. the end of the *vena porta*, and the *porus biliaris* ; the interspaces whereof happen frequently to be compressed, and stoppt by reason of the Parenchyma of the Liver being tumefied, or otherwise vitiated ; wherefore the humour of the gall not being transferred out of the separating vessels of the *porta* into the other receiving vessels, turns back upon the blood. Secondly, the passage of the humour of the gall is sometimes intercepted in the middle passages of the cholerick pore ; for that the cavities of these are filled either with a viscous, or sandy, and sometimes with a stony matter ; as is plainly discerned in the Livers of beasts in the winter season, while they are fed with hay and straw. Thirdly, it is also manifest by Anatomical observation, sometimes an obstruction in the very bladder of the gall, or in the cystic passage is the cause of the Jaundies ; for if at any time, it being filled with stones, receive not the choler, or being here shut up, or grown together, it restrains the descent of the choler towards the guts, that humour although well separated from the blood, is constrained to flow black into the mass thereof, and so propagates the Jaundies.

The cause of it.

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*The opinion of
Sylvius of the
cause of the
Jaundies.*

Against this most received opinion, by which it is judged, that the cause of the Jaundies for the most part consists on this side the *vesica fella* or about it towards the Liver: the most Renowned *Sylvius* altogether places it without this, *viz.* in the Cystic or common passage. For supposing the choler not to be separated from the blood, within the passages of the Liver, but in the very bladder of the Gall to be propagated of a humour brought thither by the Arteries; He judged the greatest part, being carried upwards by the passage of the *pori bilarii*, to be poured into the blood for some notable uses, and also another part to descend beneath to the Intestines, also for necessary uses: wherefore if this latter sluice be shut, all the choler is carried upwards into the blood, and filling it too much with this humour, perverts it from its genuine temper into an Icteric.

But truly lest the stopping of the passage of the bladder, or of the common passage, (neither of which easily happens, or from any light occasion) may seem less efficacious to excite any Jaundies; therefore, *whether such an obstruction hath place, or no*, the most Renowned man ingeniously supposes besides, *The choler while it is generated in the bladder does undergo sometimes a notable change, by which it is moved, and is born about more plentifully and impetuously, towards the blood, with which yet it is less mingled than it was wont to be, but only confounded together with it, and so more easily departs from it and infects and tinges the solid parts with its colour.*

But that the choler in the Jaundies may be rendred unfit to mix with the other humours, or to be nearly united; he determines it to be done, by a spirit too valarile, mixed plentifully with it, and so making it more spirituous and immiscible with others. He confirms this assertion by two instances, *viz.* in as much as the most spirituous poison from the biting of a Viper, and the too much use of the more generous drinks, *viz.* Wine and Strong-waters, causes sometimes the Jaundies. Moreover he endeavours to procure credit to this Hypothesis, for that this disease is wont to be cured, not only by medicines opening obstructions, but by them which blunt the force of a raging volatile salt (of which sort are the decoction of Hemp-seeds, also Venice soape, with many other things of the same sort.)

It belongs not to this place, neither is it to our purpose to descend to end this contention, nor dare I now rashly determine it (since it hath tired so many Renowned Wits of the Moderns) whether really the choler be made in the bladder of the Gall, or whether it be only separated from the blood in the Liver, the great organ of separation; I confess this latter opinion best pleases me. And weighing these things seriously I am induced to think the cause of the Jaundies to consist chiefly in this, that the choler being sever'd in the Liver, is not, by reason of the ways being obstructed, at all, or not enough conveyed to the bladder of the Gall, but that it must of necessity regurgitate into the mass of blood; notwithstanding in the mean while we deny not, but this affect may sometime arise (although more rarely) from the Cystic passage or common pipe being obstructed. But also we think the fault of the blood to proceed in part and perhaps sometimes wholly for the morbid cause; when to wit from its sulphurous and fixt Saline Particles above measure exalted, the choler is more plentifully, or quicker generated in the mass of blood, than can be separated or discharged forth by the ordinary ways; wherefore this, separating every where from the blood with the Serum, is affixed to the solid parts, and impresses its tincture upon them. And without doubt it is for this reason that some poisons, and chiefly the biting of Vipers, and the daily use of more generous drinks, induces the Jaundies in bodies before sound, for whose cure sometime Phlebotomie, and medicines reducing the blood to a right temper, are wont to profit more than those opening obstructions. Moreover it seems for this reason, that a tertian intermitting Fever so frequently terminates in the Jaundies; for we may not suspect the passages of the Liver can be by any means obstructed, since in all fits, so great an agitation of the blood and humours, by cold, and heat, and such an evacuation of them happens either by vomit or sweat: and truly even as feaverish fits are caused, inasmuch as the sulphurous part of the blood being too much advanced, in the first place perverts the nutritious juice into a morbid matter, and afterwards being inflam'd consumes and exterminates it; so when the fixt salt is at last exalted together with the sulphur in the blood, and for that cause meer choler is abundantly engendered, the feaverish enkindling of the blood ceases, by reason of the restrictive force of the fixt salt, and in place thereof the distemper of the Jaundies doth succeed. But as the blood being too much advanced to a sulphureous saline distemperature causes the Jaundies in any, though least predispos'd to it; so in others very much disposed thereto, having the ways of choler obstructed and the sulphur of the blood being too much depressed, it produces a freedom from that disease; for I have known many cachectick and phlegmatick persons, to have been free from the Jaundies though they

*The Authors
opinion.*

*The cause of this
disease some-
times in the
blood.*

they have suffered under obstructions and indurations of the Liver, as to most of its passages. P H A R.
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It is not worth our labour to make more ample disquisition about the *Ætiologie* of this disease; as to what respects the cure, there will be three primary indications, all which (for what may be the chiefest of them, and first to be exhibited, for the most part is concealed) we shall prosecute together; wherefore the intentions of healing shall be, 1. That the obstructions of the passages or choler-bearing vessels be opened, if perhaps any shall be either in the *porus biliaris*, in the Cystic passage, or in any place about the Liver. 2. That the blood be reduced to its due temperament and mixture, lest it ingender choler above measure, or render it unapt to be voided. 3. That the strength may be sustain'd, and the symptoms chiefly hurting them may be withstood.

1. That we may satisfy the first indication, Cathartic evacuations notably conduce, as well by Vomit, as siege, whereby the choler's descending towards the intestines may be furthered, and vessels obstructed, by the great shaking of them, freed from their obstruction. 2. Sharp, bitter, salt Medicines and others indued with a certain briskness ought also to be given, which provoke the motion of choler gathered in the Liver, and stagnating; hither also ought to be referred, what by similitude of substance, and as it were signature, in as much as they are indued with a yellow juice, have the report to help against the Jaundies; notwithstanding many of these may fitly be numbred under the same classis of evacuators, as the former, because they move Urine or Sweat. The 1. Indication.

The second indication altogether requires alteratives, *viz.* Medicines which may depress the exaltations, or ragings of the Sulphur and fixt salt, and in the mean time provoke the restitution of the volatile salt depressed; for these ends remedies endued with an acid or volatile salt, besides chalybeats do principally bring help; from hence spirit of salt, of vitriol, juice of Lemons, also spirit of Harts-horn, also dung of Sheep and Geese, *Crocus Martis* and divers other preparations thereof, are frequently used with success in the Jaundies. The 2. Indication.

The third indication vital suggests more and sundry intentions of cure, procuring the strength to be restored, and the removing the symptoms whereby it is prejudiced, all or the chief particularly to enumerate, and prescribe would be a vast and tedious work; wherefore we will annex only certain general rules about diet, and some Cordials and Anodynes appropriate in this condition. The 3. Indication.

The curatory indications being appointed after this manner, it next lies upon us to accommodate the most select Medicines, *viz.* as well the simple as the compound, to these now proposed intentions of curing, and to unfold the manner and reason of the Operating of remedies which are accounted of special note in this disease. Therefore first we propound the forms of evacuating Medicines appropriate in the Jaundies. Forms of Remedies.

1. Vomits.

Vomiting Medicines are frequently wont to help in the recent Jaundies, while the tone and strength of the bowels are firm; in as much as they alleviate the stomach always oppressed in this disease with an unprofitable burden of viscous Phlegm; and moreover do free their infarctions by irritating the *vasa choledocha*, and by much shaking all the passages of the Liver, and make easie the passage of the choler by the former accustomed ways. Vomits.

Take of the infusion of *Crocus Metallorum* from half an ounce to six drams, Wine of Squils an ounce, Oxymel simple half an ounce, make a Vomit to be taken with Government.

Sometimes it is convenient to exhibit, the evening before, the following preparatory Medicine for the easier Vomiting.

Take of the Powder of *Asarum* roots, *facula Aronis* of each a scruple, of Tartar vitriolated half a scruple, of Oxymel of Squils an ounce, mix them.

Take of Sulphur of Antimony seven grains, Scammony sulphurated eight grains, cream of Tartar half a scruple, make a Powder, give it in a spoonful of Panada.

Take nine *Asarabacca* leaves, cut and bruised put them into three ounces of White-wine, press out the liquor, let it be taken in the morning with regiment.

Take of Gambugia prepared eight grains, Tartar vitriolated seven grains, make a Powder.

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2. Catharticks.

Purgers.

Purgers take place in this disease, be it recent or inveterate, viz. that as well a more plentiful store of Excrements may be now and then withdrawn from the first passages, as that the *vasa choleodocha* may be excited to Excretions.

A Bolus.

Take of Electuary of juice of Roses three drams, Rhubarb a dram, Salt of Wormwood, Cream of Tartar, of each half a Scruple, Syrup of Rhubarb, make a Bolus.

Apozems.

Take of the roots of sharp-pointed Dock prepared one ounce, the tops of Roman Wormwood, of Centaury the less, of each P. ij. Gentian and Turmerick roots an. two drams, yellow Sanders one dram, boyl them in a Pint and a half of Spring-water to a Pint, adding towards the end Senna six drams, the best Rhubarb three drams, Agarick a dram and half, Coriander-seeds two drams, White-wine two ounces, let them boyl close two hours, after strain it and clarify it by settling; the Dose from four ounces to six, with one ounce of Syrup of Rhubarb, the water of Earth-worms three drams; make a Potion to be repeated every or every other day, for three or four dayes.

In a weaker Constitution.

A Potion.

Take of choice Rhubarb two drams, Agarick trochiscated, half a dram, Cinnamon half a scruple, Ginger half a scruple, make an infusion in White-wine and Chichory-water, of each three ounces, for three hours, in it strained dissolve one ounce of Syrup of Rhubarb, water of Earth-worms two drams. Or Rhubarb from half a dram to a whole one, Salt of Wormwood a scruple, make a Powder.

Pills.

Take pil. Ruffi a scruple, Extr. Rudii half a scruple, make 4 Pills, take them in a morning with government, after 4 or 5 dayes repeat them.

Deopillative
Medicines.

In the third place follow Deopillatives, which are also Diureticks, or Diaphoreticks, some whereof are accounted specifick, by reason of similitude of substance; Medicines of this sort, both promote the separation of choler from the blood, and urge the passages of it, being separated, through the passages and pores in the Liver open but little. Moreover, in the mean time, by dissolving the blood, they carry off the ferosities and cholerick recrements thereof, sometimes by Sweats and Urine.

Elixir.

Take of Elixir Proprietatis one ounce, take 20 drops in the morning, and at Five in the afternoon, with a convenient vehicle: after the same manner are taken, Tincture of Antimony, or of Salt of Tartar, and the simple mixture in a greater Dose: for vehicles, Apozemes, Spilled Waters, and Juleps for this Intention of curing are convenient.

Apozems.

Take of the roots of Celandine the greater, stinging Nettles, Madder, of each one ounce, tops of Roman Wormwood, white Horehound, Agrimony, Germander, of each one handful, Worm-seeds two drams, Shavings of Ivory and Harts-horn, of each two drams, yellow Sanders a dram and a half, Coriander-seeds two drams, boyl them in three pound of Spring-water to two pound, adding of White-wine four ounces, strain it, and add Syrup of Chichory with Rhubarb two ounces, water of Earth-worms, an ounce and a half, make an Apozeme, the Dose four or six ounces twice in a day.

Take of white Horehound dried, Centaury, of each one handful, Gentian and Turmerick-roots, of each three drams, Cinnamon one dram, Saffron half a dram, being sliced put them into a Glas with two pound of White-wine or Rhenish-wine; make an infusion, the dose three ounces

To this we will add Gesners famous Antictericum.

Take of the roots of stinging Nettles a pound, Saffron one scruple, bruise them well, and draw off the Tincture with White-wine, the dose three ounces 4 or 5 dayes.

Empirick Re-
medies.

Like to the former is that of Fr. Joel. Take the Roots of Celandine the greater two handfuls, Juniper-berries a handful, bruise them and pour on them a pound of Rhenish-wine, and draw out the juice, the dose four ounces twice aday.

The juice of White Horehound is mightily commended by Dioscorides, and the Syrup of the same by Forestus, for curing the yellow Jaundice.

In lieu of an Elixir, and other Chymical liquors, which to avoid nauseousness are to be taken in very small quantity; to others endued with a stronger Constitution, Electuaries, Powder and Pills may be administred with better success.

Take of Conserve of Roman Wormwood, of the yellow Rinds of Oranges and Limons, of each two ounces, Species Diacurcuma one dram and half, powder of Ivory, yellow Saunders, of Lignum-Aloes, of each half a dram, Troches of Capers one dram, of Rhubarb half a dram, Salt of Wormwood two drams, with Syrup of Chichory with Rhubarb make an Electuary, the dose the quantity of a Chesnut twice aday, drinking after it three ounces of the following Julep.

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An Electuary.

Take of the greater Celandine-water, Fumitory, Wormwood, Elder-flowers of each five ounces, Snail-water, water of Earth-worms, compound, of each two ounces, Sugar half an ounce, mingle them and make a Julep. Or,

Take of the roots of stinging Nettles, Angelica, Gentian, of each four ounces, the greater Celandine leaves and roots, six handfuls, Wormwood, Tansie, Southern-wood of each four handfuls, the outer rinds of twelve Oranges and four Limons, prepared Worms and Snails of each one pound, Cloves bruised two ounces, being all cut and bruised pour upon them eight pound of White-wine, let them be distill'd in a cold Still, and the whole water mixt.

Or, Take of filings of Steel one pound, fresh Strawberries six pound, put them into a glazed pot, stirring them together, and let them stand aday, afterwards add of English Rhubarb sliced one pound, the rinds of four Oranges sliced, pour upon them of White-wine six pound, and distil them according to Art; let all the liquor be mixt together. The dose of this and of the former is three ounces twice in a day after the Electuary or any other Medicine.

Take of Turmerick-roots, Rhubarb, of each one dram and a half, the Bark of Caper-roots, of Asarum-roots, of each half a dram, Extract of Gentian, and Centaury, of each one dram and a half, Salt of Wormwood four scruples, Water-cress-seeds, half a dram, of Rocket half a scruple, Elixir Proprietatis one dram, gum Ammoniacum dissolved in the water of Earth-worms what will suffice to make a mass, form it into small Pills, the dose is half a dram evening and morning, drinking after it three ounces of the distilled water.

Sylvius doth much magnifie for cure of the Jaundies, the Decoction of Hemp-seed in milk, and the solution of Sope, and from thence endeavours to establish his own Hypothesis (as we have above intimated) whereby he endeavours to deduce the Aetiology of the Jaundies, rather from an alienation of the choler, than from the obstruction of its passages.

Sylvius his Empirical Remedies.

2. The Second Indication respecting the altering or tempering of the blood, by which it may breed but moderately, and duly separate the choler, requires Medicines of that fort, which depreß the Sulphur and fixt Salt too much advanced. For these ends, I know not by what chance or conduct Medicines endowed with a volatile Salt, as Worms, Snails, Millepedes, yea Lice, Dungs of fourfooted Beasts, and Fowl, are brought into practice for curing the Jaundies, and not only prescribed by Empiricks, but the more famous Physicians: These sometimes by themselves, but oft'ner joyn'd with Purgers and Deoppilatives, become the chief Ingredients in Compositions against the Jaundies.

The second Indication. Remedies against the Jaundies endowed with an animal volatile Salt.

Fonsæca prescribes Goose-dung gathered in the Spring-time and dried, as also the white excrement of Pullets, of both which let the powder be given in a convenient vehicle from half a dram to a whole one.

Take powder of Earth-worms prepared, of Goose-dung, of each three drams, Ivory, yellow Sanders, of each half a dram, Saffron one scruple, make a Powder, divide it into six parts. One to be taken every morning with some appropriate liquor. To the Apozeme, or Antiseptic Tincture prescribed above, Earth-worms, Goose-dung, and also Sheeps-dung are profitably added.

Various forms of them.

Take Millepedes fresh and alive from 50 to 100, Saffron half a scruple, Nutmeg a scruple, bruise them together, and infuse them in Water of Celandine four ounces, of Earth-worms two ounces, express them strongly, and drink it: after this manner take it first once, then twice in a day for a Week.

The vulgar and Empirical remedy with us is, that Nine quick Lice be taken in a morning for five or six dayes, by which remedy they report to me many to be cured (whenas other remedies effected little) which truly can help by no other means than by restoring the volatile Salt depressed in the blood.

Upon the same account of succour even in this disease the flowers of Sal Armoniac, the volatile Salts of Amber, Harts-horn, Soot, in like manner their Spirits are frequently administred with great success.

Also such as are endued with a mineral volatile Salt.

Take

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Take powder of Earth-worms prepared two drams, Species Diacurcuma one dram, flower of Sal Armoniac half a dram, Salt of Amber a scruple, Extract of Gentian one dram, Saffron one scruple, Gum Ammoniacum dissolved in water of Earth-worms what suffices, make a mass, and form it into small Pills; the Dose is three or four, morning and evening, drinking after it three ounces of the Julep before prescribed.

Take Spirit of Harts-horn tinctured with Saffron three drams; Dose from 15 drops to 20. with the distilled water prescribed above.

Steel remedies
of several kinds.

In this Class of Medicines by which the icterical distempers of the blood are to be corrected, steel'd remedies do also challenge their place by right; for these afford notable help, not so much by unlocking the obstructions of the bowels, as by depressing the rage of the Sulphur, and fixt Salt, and by volatilizing the blood, in the Jaundies, no less than in other cachectical distempers.

Wherefore, to the Decoction, or Tincture, or Infusion above prescribed, is properly added the filings of Iron, or the prepared powder thereof (its mineral consistence being some ways opened) or the vitriolic Salt extracted; from hence it is, that Medicinal waters heal even to a miracle those sick of the Jaundies, that had been despaired of; although these drunk in a very large quantity, inasmuch as they pass through all the vessels, do also open the passages of the Liver, however shut up.

Therefore also even Preparations of Steel are added to the Electuary, Pills and Powders above recited, one while this, another while that, in due proportion. Moreover the Syrup thereof given twice a day to one spoonful, in three ounces of Apozeme or water against the Jaundies; also tincture of Steel to twelve or fifteen drops may be administered in the same manner.

Outward and
Sympatherick
remedies against
the Jaundies.

In the last place we may annex to this Class of altering Medicines those things which not taken inwardly, but outwardly applied, and by contact, used to the very urine of the Patient are held to cure this disease.

As to the former, a remedy often tried by the vulgar, is a living Tench-fish, whose scales and outer superficies do resemble a yellow colour, applied to the right Hypochondria, or Stomach according to some, (to the soles of the feet, according to others) whence a sudden flight of this disease is expected; hence although many promise themselves a sure cure, it hath often deceived me.

Another cure of the Jaundies at a distance is said to be done by I know not what sympathy or secret manner of working.

Take the fresh Urine of the Patient made at one time, of the Ashes of the Ash-tree searced, as much as suffices to reduce into Paste, which may be formed into three equal balls, to be placed in a place shut, near the Hearth or Stove; as these dry and harden, the Jaundies will vanish; after this course, I have known this inveterate disease happily cured; although resisting many other remedies; the practice thereof is very familiar with the Vulgar.

The reasons of
some of them.

If of a certain it could be made manifest that this effect doth for the most part happen, and the reason of it be inquired into; in the first place we ought to suppose a consent or sympathy of the spirits and other particles in the animated blood, with other symbols inmates of the fresh Urine; and that they are immediately affected in the like manner with these. Notwithstanding it is evident enough that a lixivial Salt mingled with Urine, doth presently set free the volatile salt formerly subdued or enwrapt in other particles; as is plainly seen in distillation of Urine, which if you urge by it self with a sand-heat, nothing but Phlegm will arise; but add the calx of Tartar, or Ashes, immediately the Spirit and volatile Salt will come forth: wherefore, that Empirical administration being administered, at the same time, both in the Icteric Urine, and also in the blood of the Patient, the volatile Salt escapes out of the power of the fixt Salt and the Sulphur, and for that cause the Icteric distemper of the Blood is put to flight. Also upon the same reason is built another sympathetical cure of the Jaundies, whereof Phil. Grulingius, and Felix Platerus do make mention, viz. the sick party pissing upon Horse-dung while it is hot, hath cured many of the Jaundies; inasmuch as the fixt Salt of the Urine, and thereby the fixt Salt of the icterical blood of the Patient, is altered by the volatile Salt of the fresh dung, and reduced into its due temperature.

The third Indication vital.

3. The third Curatory indication vital institutes a convenient course of Diet, and moreover Cordials and Anodynes, of both which there is frequent need.

As to what relates to the former, Food in this disease, more than in any other ought to be medicinal. For Vegetables and their parts, styled commonly Hepatick remedies, are boyled in the broths of these Patients. And these also are wont to be made instead of other flesh, of Worms, or Snails, (which are accounted Antidotes against it

the Jaundies.) Moreover Ale, and other ordinary drinks are impregnated with infusion of Medicaments.

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Take of the roots of *Stinging Nettles*, of *Strawberries*, of each an ounce and half, *Eringo-roots* candied one ounce, *Ivory* and *Harts-horn*, of each two drams, *Earthworms* cleansed twenty, a Crust of *White-bread*, Mace two drams, boyled in two pound of water to one pound, strain it through *Hippocrates sleeve*, to which add *Diasantalon* half a dram, make breath, whereof take from four ounces to six, twice in a day : for ordinary drink, fill a Tub of four Gallons with Beer, after it hath wrought, put in the following Bag.

Take the tops of *Roman Wormwood*, white *Horehound* dried, of each two handfuls, the roots of sharp pointed *Docks* six ounces, of the Bark of *Ash*, of *Baxberries*, of each 3 ounces; the outer Rinds of eight *Oranges*, and four *Lemons*, being sliced and bruised, let them be prepared according to Art.

Since many sick of the Jaundies are usually affected with a great languishing, and frequent faintings of the Spirits, they have also need of cordial Remedies.

Take of small *Aqua Mirabilis* eight ounces, water of *Earth-worms* four ounces, Syrup of *Orange-peels* two ounces, mingle them, the dose two or three ounces.

Moreover, they who are troubled with this disease, do very much suffer with pain sometimes very troublesome in the night, and are often obnoxious to waking; wherefore also Anodynes come into use for administration. Forms of Cordials.

Take of *Aqua Mirabilis*, water of *Earth-worms*, of each one ounce, *Diacodium* six drams, Tincture of *Saffron* half an ounce, the dose one or two spoonfuls late at night, if sleep be wanting.

Take of *Laudanum tartarizated* two drams, *Aqua Mirabilis* two ounces, Syrup of *Clove-gilly-flowers* one ounce, mix them, the dose is one spoonful after the same manner.

SECT. II. CHAP. II.

Of other Hepatick Remedies.

THe Liver is feldome or never found obnoxious to an Atrophie or extenuation; since truly it performs the office of a strainer, and according to some, of a mingling bowel; but on the contrary by reason of many causes and occasions it runs the hazard of being encreased as to its bulk, and to be stufft and swell'd with divers things gathered therein, and with concretions. Hence no small account of health consists in this, that the Liver having right conformation may freely convey the blood every where, without keeping back too much Custome or provision for it self.

Truly many faults, and indeed not altogether undeservedly, are imputed to this Bowel, as also unto the Spleen; the chief Kinds of which we shall touch upon. The Liver frequently and chiefly is wont to be faulty in one of these two, viz. First that intercepting the nutritious juice appointed for other parts, it bestows it to its own proper use; this is plainly discerned in Children affected with the Rickets, and moreover in many others that lead a sloathful and idle life. Anciently there was an art with the Romans so to feed a Goose that the Liver prodigiously encreased might weigh more than the whole body. Secondly, the other fault of the Liver is, that it too easily receives all the excrements and feculencies whatsoever of the depraved Blood, brought into its inward recess, and by retaining them there, doth not only grow large, but is obstructed in its passages, whence frequently comes the Jaundies, or a Dropsie; it contracts also tumours and preternatural Concretions of divers kinds of matter.

Many and divers distempers of the Liver ought to be referred to these two heads: of each of which it is not our purpose to institute particular pathologies. As to what appertains to the general pharmacie of this bowel, there will be one principal scope of curing, that its income be diminished as much as may be, or altogether cut off. The Kinds of Remedies assigned to the Liver.
Wherefore Two general intentions of curing this bowel.

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Wherefore it will behove us to procure these two things, *viz.* That the Liver augment not above measure, by taking the nutritious juice too much unto it self; and that it retain not the feculencies of the Blood, whereby it may be affected with obstructions and preternatural Tumours.

It will be much easier to prevent than cure either of these faults of this bowel. For truly the former may be done, respect being had only that the blood be well constituted in its Temperament, and enjoying a free Circulation, it may both dispense its nutritious juice to the parts, and especially its outward parts, and driving forth all its excrements to the particular Emissaries, it may put them away there. And surely, the Medicines vulgarly called Hepaticks, do first and more immediately exert their power by purging the blood, rather than by correcting of the Liver: those namely consist of particles of such a kind, which entering into the blood, and not mixing with it, do so stir up the mass thereof, and break it into pieces, that all the Coagulations and Concretions being taken away, all its drugs and impurities may easily depart, and being carried to their proper Emunctories may be cast out of doors.

Medicines vulgarly called Splanchnick, first and chiefly operate upon the blood.

For truly all remedies which are called Splanchnick, first work upon the blood, and incite its constitutive parts into a kind of effervescency, and so toss, divide, and move them rapidly to and fro, that the vaporous effluvia being sent into the habit of the body, the ferous excrements into the Kidneys, the cholerick into the Liver, the melancholy into the Spleen, and others to other Emissaries for which they are fitted, may be shut out, without impediment or adhesion.

What such they are which more especially respect the Liver.

Wherefore the same Remedies which help the Liver, help also the Spleen, the Reins, the Lungs, and other the Bowels in their separations; and for the most part move sweating and urine. If any be found to respect one part before the rest by any specifick power, it is therefore because their particles being more ally'd unto the excrements to be separated within that bowel, and from thence associated to them are conveyed thither together with them. For this reason Rhubarb, Turmeric, the greater Celandine, with many others adjoyned to the bilious humour, do the more easily reach the passages of the Gall, and are wont to succour in the Jaundies. We have observed before, the energies and manners of operating of Medicines of this kind. As to what appertains to the other, vulgarly called Hepaticks, first we will annex briefly certain forms of those which are reported either to prevent or remove the unnatural augmentation of the Liver, and then those which are held to provide against or take away the obstruction and preternatural Tumours thereof.

1. Against the too much encrease, or improporionate nutriment of the Liver, first a more sparing and thin diet, short sleeps, and moderate and frequent exercises are convenient: wherefore we prescribe for Infants, and Children, when they are discovered obnoxious to this distemper, as in the Rickets, that they suck thin and ferous milk, that they be shaken or tossed in their Nurses arms, and tumbled quickly to and fro, or be carried swiftly in a Chair or Coach, and as soon as may be, learned to go and to use their feet.

Some form of Hepaticks.

Take of the water of Snails, of Earth-worms, of each three ounces, Syrup of Chicory with Rhubarb two ounces, spirit of Sal Armoniac with Gum Ammoniacum one scruple, mix them, and take a spoonful evening and first in the morning.

Take of the roots of Maleferne, Chervil, candied Eringoes, of each one ounce, the leaves of Arrimony, Harts-tongue, male Speed-wel, of each one handful, Shavings of Ivory, Harts-horn, of each two drams, white and yellow Sanders, of each one dram, Raisins stoned one ounce and a half, Barly three drams, boyl them in three pound of Spring-water to two, to it strained add of Snail and Earth-worm water, of each one ounce and half, Syrup of Chicory two ounces, make an Apozeme, take two or three ounces in a day.

Take powder of white and yellow Sanders, Crabs-eyes, Lignum-Aloes, of each half a dram, Salt of Wormwood one Scruple, make a powder, the dose half a Scruple to a whole one twice a day.

Take Empl. Diasaponis, Cerate of Sanders, of each what will suffice, make a Plaister to be applied to the Hypochondrion.

Take Unguentum Splanchnicum two ounces, Oyl of Wormwood one ounce, mix them, and make a Liniment for the region of the Liver.

Hither many other methodical as well as Empirical Medicines being used for the Rickets may be referred, but we hasten to other things.

2. Remedies ordained for most other distempers of the Liver are either simple or compound. Very many of the former sort are reckoned by Authors, as if they were procreated for this particular use. Heurnius says, That God Almighty hath offered to the

Their numbers enumerated.

the World the greater plenty of Remedies of this kind, by reason of their notable necessity. And P H A R:
to this Rank may be referred in the first place all kinds of Chichories, the Sorrels, Part. II.
the sharp pointed-Docks, and almost all Vegetables endowed with bitternefs and some-
thing of sharpness, (wherein the deopillative vertue is reported to consist) as Worm-
wood, Germander, Ground-pine, Fumitory, Tanzy, Agrimony, Liverwort, Lignum
Aloes, all the Sanders, Tamarisk-bark, and Ash-bark, the roots of Capers, with ma-
ny others, which commonly make up the greatest part of Herbals; so that whilst
the Liver like a certain Goddess ruled sanguification, very many Medicines were used
to be ascribed for its safeguard and succour.

First Simples.

The fixt Salts of herbs, the acid Spirits of Minerals drawn by distillation, belong by
right to this number, as they do chiefly exagitate the mass of blood, dissolve the Con-
cretions thereof, dispatch their obstructions, and cause it every where to be passable,
as to all the parts thereof.

If I here omit Chalybeats, most Chymists will censure me very unjust to the Liver; Chalybeates.
for truly as the Prerogative of *Venus* is vulgarly attributed to this bowel, so as to con-
strain to Love, we may hence expect that *Mars* will be perpetually kind unto it. And
really it is manifest by Reason, as well as Experience, that Preparations of Steel are
convenient in hepaticall affects, as chiefly in the Jaundies, and oftner in the Dropsie;
wherefore these are put into the Receipts of the Ancients and Modern, and among
curatory Compositions. For what reason the Preparations of Steel, as in like man-
ner the medicinal waters from Iron, as well natural as artificial, do purifie the mass
of blood, and by consequence do relieve many distempers commonly call'd Hepati-
cal, is shewn by us largely enough in another place, so that here is no need for repe-
tition.

Medicines that are appointed by Physicians for the Liver are divided into vari-
ous forms, but first into hot and cold, and also into moist and dry; accordingly as the
temper of this bowel is supposed to consist after divers manners, when in truth it is on-
ly a dyscrasie of the blood, which being so diversly faulty, desires so various an energy
of medicines. Neither is it a less vulgar error, that in the estimating of mens constitu-
tions, the various temperament of every one due to the blood, is ascribed chiefly to the
Liver, as hot or cold, or otherwise disposed.

In the Antidotaries of the Antients there are many Shop-compositions extant, which
seem to be designed for the Livers sake only, of which sort are *Rhasis* his Electuarie of
the drops of Iron, *Crocus ferri* of *Balchusis*, which being mixt with Treacle is commend-
ed for hepaticall affects; the species *Diarrion Santalon*, *Diarrhodon Abbatis*, *Trochisc* of
Rhubarb, of *Agrimony*, of *Capers*, *Diacurcuma*, *Dialacca*, Syrup of *Wormwood*, *Chico-*
rie, of the five roots, *Byzantinum*, with many others, unto all whose forms, a vast
Catalogue is annexed for curing all the diseases of the Liver. But these passed over, it
pleases me now to propound some Kinds and Examples of Medicines which are count-
ed deopillative according to the practice of the Moderns.

The Shop com-
positions of He-
paticke.

Therefore for an opening Decoction,

Take of the roots of *Ferne*, *Chervil*, *stinging Nettles*, *Dandelyon*, of each one ounce,
the leaves of *Agrimony*, *Harts-tongue*, *Speed-well*, *Oak* of *Jerusalem*, *Liver-wort*, of
each a handfull, white and yellow *Sanders*, of each three drams, *Ivory* half an ounce,
red *Cicars* an ounce, *Coriander-seeds* three drams, *Raisins* two ounces, boyl them in four
pound of water to two pound, adding towards the end *White-wine* four ounces, strain it
through *Hippocrates Sleeve*, to which add Species *Diarrhodon Abbatis* one dram, of our
prepared *Steel* two drams, Syrup of *Chicory* with *Rhubarb* two ounces, the *Water* of *Snails*
and *Earth-worms*, of each one ounce, the dose six ounces twice in a day after a dose of
the following Electuary.

Magistral
Compositions.

Take of *Conserve* of the yellow of *Oranges* and *Lemons*, of each two ounces, of *Wormwood* Electuary
and *Fumitory*, of each one ounce, simple Powder of *Aron-roots*, yellow *Sanders*, *Lignum*
Aloes, of *Caper-roots* of each one dram and a half, *Crabs-eyes* one dram, Salt of *Wormwood*
two drams, Syrup of *Fumitory* what suffices, make an Electuary, the dose the quantity of
a Walnut twice in a day, drink after it a draught of the *Apozeme* now prescribed, or of
the following distilled water.

Take the leaves of *Wormwood*, *Centaury*, *Tansie*, both sorts of *Southern-wood*, *Tamariske*, A distilled Wa-
ter of each four handfulls, of green *Walnuts* four pound, of *Ashen keyes* green two pound, the ser-
vise of ten *Oranges* and four *Lemons*, *Snails* and *Earth-worms* prepared, of each one
pound, all being sliced, pour on them of *White-wine* eight pound, distill it in a cold Still, let
all the liquor be mixt together, the dose three ounces, sweetning it with *Sugar* or a fit Sy-
rup.

PHAR. If a form of Pills will please better, the ensuing Extract called in the Shops *Extractum Ecphracticum*, seems profitable.

Pills.

Take of white and clear Tartar, and of fresh Filings of Iron, of each 4 ounces, let them be ground together into powder, after boyl them in Fountain-water from four pound to two (some use White-wine) to the strained liquor add the tops of Centaury, of Roman Worm-wood, of Carduus, of each one handful, Gentian-root half an ounce, Species Diacurcuma an ounce and half, let them boyl shut close for three or four hours, strain it, and evaporate by the heat of a Bath to the consistence of Pills, adding roots of Rhubarb or Species of Hiera Picra two drams; the dose is from one scruple to half a dram made into Pills, in the evening, with an appropriate vehicle.

For the same intention, viz. to prevent or to remove the obstructions of the Liver, a medicated purging Ale, to be taken many dayes in Spring and Autumn, is by some very much magnified, and exactly observed every year during their lives.

Take of the roots of sharp-pointed Docks prepared, Polypodie of the Oak, of each 3 ounces, Madder-roots two ounces, English Rhubarb two ounces, of leaves of Senna four ounces, Epi-thymum two ounces, yellow Sanders one ounce, Carthamus and Coriander-seeds, of each one ounce and a half, slice them and bruise them according to Art, make a bag for 4 gallons of Ale, after six dayes let him take to 12 ounces more or less in the morning, expecting four or five Stools without regiment.

SECT. II. CHAP. III.

Of Remedies for the Dropsie called Ascites.

After the Jaundies and the Remedies thereof, our method leads us to treat of a Dropsie; not because of the Vulgar opinion, that it always arises from the fault of the same bowell; but because that former disease having long continued, for the most part concludes in this: which happens so, not so much from the fault of the Liver, as from the whole Blood, for this and not that perform sanguification. Wherefore, when the masse hereof hath for a long time been filled with cholerick excrements, and at length degenerating from its temper, accumulates also watery humours, then doth a Dropsical Disposition come upon the Jaundies.

The more remote causes of an Ascites.
First in respect of blood.

But whereas three sorts of Dropsies are vulgarly supposed, viz. *Ascites*, *Tympanites*, and *Anasarca*, we will at present handle only the two former, appertaining to the Splanchnick or Pathologie of the nether Belly. And first what relates to an Ascites, this disease as to its matter and formal reason is manifestly known by the sign of even many senses together, viz. it is a Tumour of the Abdomen, from a waterish tumour contained within the cavity thereof. The water making this tumour, sometimes encreases to a huge inundation, and scarce credible quantity. I have once seen a Tub would hold 15 gallons filled with water taken out of the Abdomen of a woman dead of a Dropsie. But whence that humour proceeds, also by what manner, and from what causes it gathers together in the belly first, and afterwards is sensibly augmented; and lastly by what passages, and by what vertue and operations of Hydragogue Remedies, it may again be taken from thence, and evacuated, seems most difficult to be unfolded.

It doth not always proceed from the Liver and Spleen.

As to the former, viz. the encrease of water, some have thought it to descend from the Liver, and others from the Spleen distempered, into the cavity of the Abdomen; and so this bowell, or that being vitiated, always to be the cause of an Ascites. But that this is otherwise, Anatomies of many dead of this disease, do manifestly declare: when after the inundation of the belly, the Liver and Spleen are found often without fault. And truly these bowels do not seem the Springs of any such illu-vies, being endowed with no cavities, wherein waters might be accumulated together: wherefore the origine of an Ascites, as of a standing Pool or Lake, is to be derived from a River, or at least a glut or inundation of some Humour.

The

The humours that flow within the passages, or Vessels as Brooks, are chiefly these P H A R.
 three, *viz.* the Blood, the milkie Humour, and the Lympha. The showering or Part. II.
 distilling of water may come to pass from the nervous Liquor which sometimes slowly
 and insensibly sweats out of the Fibres and Membranes, and from vapours condensed The humours by
which it is pro-
duced are,
 within the hollowness, or some Cavity of the Body. Whether by these ways an
 Ascites doth rather, and oftener proceed, we will now search.

And in the first place as to what relates to the blood, it is without doubt, the Se- First the Blood.
 rum falling from the mass thereof, too much dissolved, as it doth excite Fluxions and
 Catarrhs of various kinds, so it sometimes stirs up the greater illuvies of waters,
viz. Dropsical: wherefore when an Anasarca proceeds altogether from this cause, and
 when oftentimes an Ascites comes upon that disease not immediately healed, we
 may well enough infer that either distemper is induced from a watery humour, every
 where poured out from the little mouths of the Arteries. Moreover, it is not much
 improbable, that the Serum of the dissolved Blood is first and solitarily poured out
 of some end of the Coeliac and Mesenteric Arterie being open into the Cavity
 of the Abdomen, and so brings on an Ascites without an Anasarca going before; and
 so especially if perhaps it happen, that schirrhus Tumours, Ganglion's, little swell-
 ings, or preternatural Concretions of another manner, are first raised about the Me-
 sentery, the Spleen, the Liver, the Womb, or any of the other bowels of the nether
 belly: for, because the Circulation of the blood is hindred in those places, that the
 blood being carryed through the arteries, may be some way brought back, the serous
 part being thrust out from its company, falls into the cavity. For truly it is most evi-
 dently manifested, that it so comes to pass, by this Experiment mentioned by us in
 another place, *viz.* If in a living animal, the jugular veins being taken up and bound
 with a thred, the reduction of the blood be stopt, the whole Region of the head swells
 in a short space, with a water between the skin, and clearly hydropical. And truly
 I have more frequently observed that an Ascites hath followed upon secret tumours
 gathered and raised in some places in the lower belly: which certainly happens for
 the reason above recited: When the course of blood being obstructed, the watery part
 is extravasated in a short space, that humour is not merely serous, but besides, the
 nutritious Liquor, ordained to nourish all the solid parts, is emptied into the belly:
 wherefore, while this Region swells up, the members are extenuated, and the Lym-
 pha taken out from an Ascites, with heat thickens and grows white, like the white
 of an Egg.

It is also very probable, that the milkie Vessels being burst asunder, pour out their 2, & 3. The
milkie and wa-
tery humour.
 humour into the cavity of the abdomen. Truly the most renowned *Sylvius* thought
 this disease most frequently engendered from such a cause. And truly as out of the
 milkie or watery Vessels, *viz.* one of them or both together, being divided or opened,
 we may well suspect the illuvies of water or chyle sometimes to overflow the bowels
 of the nether belly; so the following observation seems to confirm the same thing.
 Of late one that had been long sick of the Jaundies, and in the mean time temperate
 and abstemious of drink (to which he was not prompted by thirst) contracted an
 Ascites, increased in a short time hugely. After that Medicines were administred in
 vain, a Paracentesis is attempted according to the manner of *Sylvius*, with a hollow
 Needle; out of the orifice, not ictical water, but lymphic and thin flowed out abun-
 dantly; from whence we may infer, that Hydropic humour flowed not out of the
 mass of blood, for then it had been coloured, but distill'd out of the lymphic or
 milkie vessels into the cavity of the abdomen. We have join'd together as akin the
 ways of the milkie and lymphic Vessels in propagating an Ascites, because both ves-
 sels do convey the chyle, or what is analogous to it, to the common Receptacle;
 and many branches or leading Pipes of either kind, are distributed about the bowels of
 the nether belly; in the mean time, it is not improbable but that a solitary fault of
 either vessel may sometimes produce an Ascites.

As to the other ways of generating an Ascites, proposed in the beginning, I am scarce
 induced to think, such an inundation of the belly can easily arise from the distilling of a
 nervous humour, or by reason of vapours there condensed: although perhaps in a Tym-
 pany where the cavity of the abdomen is enlarged, and transpiration hindred, the efflu-
 via that were wont to exhale, being forced inwards, are changed into Lympha or wa-
 ter, wherefore for the most part an Ascites is ever conjoyn'd with that disease.

The immediate or conjunct causes of an Ascites being design'd after this manner, An Ascites often
the product of
the Jaundies:
 which indeed seem to be, either a watery humour poured out of the Vessels bringing
 Blood, or Lympha or Chyle poured out of the proper passages of them both; now
 we must in the next place inquire about the more remote causes of this disease, *viz.*
 for

PH A R.
Part. II.

The kinds of a
Dropfie.

The Description
of an Ascites.

2. In respect of
the Lympha-
ducts.

3. In respect of
the milkie ves-
sels.

The differences
of this disease.

for what occasions and after what manner, the vessels affected of either sort deposite their burdens into the cavity of the belly.

First therefore, that the watery part of the blood sweats out into the *Aqualiculum* or belly, either the very Blood, or vessels containing it, or both together, are in fault. The Blood is in fault, when being depraved in its Crasis it doth not rightly contain within its consistence the constitutive parts, but being apt to be dissolved, it every where rejects its serosities from the mixture; which either it drives out by Urine or Sweat, or permitting them to reside within, pours them out into the Pores of the flesh, or the cavity of the bowels. The vessels bringing blood grow faulty for a second reason, for that their extremities or little mouths either are too much loose, or altogether shut up. In the former state the clew or Circulation of blood is not entirely and firmly continued; but the thinner and more crude part of the blood being apt to depart, is suffered to flow out near to the interspaces or inosculations of the Arteries and Veins; likewise on the other side, when the course of blood is hindered, by reason of a tumour or obstruction of some vessels, their little mouths being thoroughly closed; to this being so straitned that a passage may be made open by some means that which is thin and watery is extravasated, and sent away into the neighbouring places, as we have shewed above.

2, & 3. But an Ascites beginning alone, doth often arise, by reason of the milkie or lymphatic vessels being depraved; wherefore seeing we suppose the cause of this kind of disease to be oftentimes conjunct, we must enquire, by what means, and for what occasions, these vessels are wont to be so opened or burst asunder, that they pour out their liquor into the cavity of the belly.

First therefore as to what belongs to the Lymphaducts, these vessels may be in fault after a diverse manner, but chiefly, either that being obstructed or compressed near their origine, they do not receive the humour, or being burst about the middle or extream parts, do pour it out into the belly. There are many causes and reasons of effecting of either of these, for it may be viscous matter obstructs their beginnings, or glandulous, scirrhus, and other preternatural Tumours compress them, as also a vast inundation of Lympha flowing out, moreover vehement motions of the Body, or passions of the mind, may burst them asunder.

2. The milkie Vessels, no less than Lymphatick, are in danger to be broke, and so by pouring out their liquor into the cavity of the Belly, do excite the Dropie called Ascites; and truly they are wont to be hurt for the like reason, in regard their middle passages, or their ends, either are obstructed by a more viscous chyle brought into them, or by Phlegm from the intestines, or they are compressed by Tumours bred in the Mesenterie: for forthwith the chyle entering into the beginnings of the vessels, and not finding a passage, first very much distends them, and afterwards breaks them. There are many causes and occasions, for which the thicker and obstructing humours are driven forwards into the milkie Vessels; for besides an irregular Diet, and for the most part from meats hard to be digested, this evil is frequently caused by too much drink, or immoderate exercise immediately after Food, also from cold drink while the Bowels are very hot; for so the passages of the Vessels before gaping are suddenly shut, and afterwards more narrowly closed, wherefore the chyle sticking within their straitned chanel, doth thoroughly fill and obstruct them in a short space.

As to what belongs to the differences of this Disease, besides them already cited, viz. that it comes after an Anasarca, or comes solitary; that this also is manifold and after a diverse manner, according as the Vessels bringing blood, or water, or milk, are found in fault; Moreover we observe, that the Dropie called Ascites sometimes proceeds from a meer watery humour filling and distending the parts of the nether belly; but sometimes there happens to this diluge an extension of the membranes, or inflations made by the irregularities of the inmate spirits, and so they do encrease the swelling of the Abdomen; and in this case a certain Tympanites comes upon an Ascites, even as more frequently on the contrary, this is the offspring of that.

Moreover, in an Ascites meerly watery, sometimes the Lympha only fluctuates within the Cavity of the Abdomen, so that in the mean time the bowels being soakt in it, continue still entire, or little or nothing encreased in their bulk; but sometimes besides the inundation of the Lympha in the hollow of the Belly, the blood being slowly circulated there, and almost stagnating it is much diluted with water. Moreover the Parenchyma of the bowels, and the sides of the Vessels and of the membranes, and chiefly the Glandules every where numerous, being moisten'd, do swell with the flowing water

water, and so the tumour of the belly consisting as it were of many pools of water and moorish Contents, rises into a vast bulk.

The Prognostick of this Disease, is always suspected and accounted of an ill omen: for none of the vulgar but will pronounce the obstinate tumour of the belly to be very dangerous and difficult to cure: If any seem to be affected with a Dropsie, or a Consumption, with them presently the next question is, Who shall be his heir.

An Ascites beginning after an Anasarca (which proceeds commonly from the whole mass of blood being pour'd forth into serosities, and sweating them out of the little mouths of the Arteries into the cavity of the Abdomen) is accounted of easier cure, or at least of more promising hope, than that solitary disease coming from tumours about the Bowels, or from the Lymphatick or Lacteal Vessels being burst asunder; for as well the conjunct as procatactick cause of the former Disease, oftentimes is used to be removed wholly, or in part; but in the other case, both for the most part exist incurable. A reddish Urine, lixivial, and little, in an Ascites is of ill signification, for 'tis a sign that the mass of blood, being repleated with a scorbutick Salt and Sulphur boyled together, is too much bound up in its substance; insomuch that it doth not well separate the feculencies, nor discharge them by fit and convenient Sinks, which notwithstanding it doth evilly dispose by constraint into the Cavity of the Belly, forasmuch as it is hindred in its Circulation in the very same place. For in an Ascites the blood is not always dissolved as in an Anasarca, but sometimes appears too much compacted in its temper, yet so, that the salt Serum being denied to the Pores of the skin, and to the Urinary passages, by reason of the Obstructions of the Bowels is forced to break out within the abdomen.

If in an Ascites, by a Purge taken, the waters are evacuated with ease plentifully by stool, and from thence the swelling of the belly is somewhat diminished, we are not to despair of the Cure; but if Purgers bring out little or nothing of the Serum, or Lympha, and thence by reason of the Nervous Fibres being irritated, and driven into extensions or inflations of the Bowels and Membranes (as it uses frequently to be) the belly swells the more, and grows like a Drum, we may expect only a fatal event of the Disease.

About the curing of the Dropsie called *Ascites* it behoves us chiefly to consider by what ways the waters heaped within the Abdomen, may be thence brought out, and evacuated, for such an evacuation ought to be attempted only by possible ways. And here presently is to be observ'd, that the remedies used for Hydragogues according to the ordinary practice of Medicine, intend to accomplish that end by purging, by Urine, by Sweating, and by insensible transpiration: In some cases of the Sick you ought to proceed by this way, and in other cases rather by that way, or another, and if none of these seem feasible, or succeed well, let mature consultation be had for a Paracentesis. It will be worth our labour to weigh every of these kinds of Medicines, and the reasons of every one, and the manner of their operations, and with how much vertue Hydragogues are endowed.

First, therefore as to what relates to Purging, we have in another place shewed that, from the irritation of the Physick made in the belly and guts, as well the Contents and wind of these bowels, as moreover the humours driven into their Coats and Glandules, and which are heaped up in the Vessels and Pipes in the neighbouring parts, are disquieted, and partly streined into the passages of the guts, and partly returned into the mass of blood; insomuch that the tumour of the abdomen arising from the stoppage, and as it were a waterish affection of those kind of Parts, is often abated by Purgatives seasonably administred, and sometimes wholly removed; but it doth not so succeed when it proceeds from a Lympha fluctuating within the cavity of the abdomen, or from an inflammation of the Membranes, or from a tympanitic extension: because Hydragogues do little or nothing bring out those waters, and if they be of the stronger sort, they increase this passion and exasperate it by inflaming the part.

Catharticks used for Hydragogues, are either Vomits, or Purges; they exert their power in the stomach, and these rather in the Intestines; insomuch that they powerfully provoke and twitch the Nervous Fibres; and together pour forth the blood and nervous liquor by a certain septick force, and do cause the serous humours wherever impacted to be stirr'd, and do cause them plentifully to be sent away by the passage granted. Either are reckon'd of a various kind, viz. either simple or compound, gentle or strong, by the Ancients as well as by the Moderns; some of which that are most chiefly noted, we will here briefly observe.

1. *Emerick Hydragogues*, chiefly famous, are Gambugia, Esula, Spurge, and their several Preparations, as also the *Hercules of Bovins*, and the *Pilula Lunares*.

2. *Purgers*

P H A R.
Part. II.

The Prognostick;

The cure of an
Ascites.

By what and
how many re-
medies the e-
duction of the
water is to be
endeavoured.

First by purging;

Catharticks are
either Vomits
or Purges.

P H A R.
Part. II.

The chief medicines of either kind.

1. *Gummi gutta.*

Its various Preparations.

The forms of Hydragogues prepared thereof.

2. *Spurge.*
The Preparations thereof.

Forms.

The Hercules of Bovins.

2. *Purgers* are Elder, and Dwarf-Elder, Soldanella, Gratiola or Hedge-hysope, the Juice of Orris, and Elaterium. We will briefly prescribe some methods either of preparing or compounding or administering each of these.

1. *Gambugia*, first an Indian Medicine, being from thence brought by our Country-men, from the Painters Shops coming into the Apothecaries, began to be in use, and is much magnified for Purging out serous humours. But so far as taken by it self it vehemently disturbs the Stomach, and often weakens it, therefore, that the outrageous and violent Vomiting force may be somewhat abated, there are divers ways of its Preparation invented; but truly it is best corrected with an acid Spirit, or with an alcalizate Salt, or by thoroughly mixing and correcting it with aromatics.

Adrian à Mynsicht, extolls the magistery thereof, which is made by a dissolution in Spirit of Wine, and after drawing it off, and precipitating it with Spring-water; also dissolving it with Spirit of Wine vitriolated, and with a tincture of Roses, and red Sanders, and after by evaporating it: others prepare it with the fume of Sulphur after the manner of Scammonie sulphurated; others grind it on a Marble, moistening it with Oyl of Cinnamon, or Cloves, or other Chymical Aromatics. I use most the Solution thereof made with a tincture of Salt of Tartar, the dose from 15 drops to 20 or 30.

Take of Gum-gutta, gr. 6. Mercurius dulcis, gr. xv. Conserve of Violets, a dram and a half, make a Bolus.

Take of Gambugia twelve grains, Salt of Wormwood fifteen grains, Oyl of Mace one drop, Conserve of Damask-Roses one dram, make a Bolus: and it is wont to be given with Tartar vitriolate or Cream of Tartar, and powder of Rhubarb.

Take of Gum-gutta sulphurated, or vitriolated, fifteen grains, Cream of Tartar half a scruple, Extract of Rhubarb one scruple, Oyl of Cinnamon, gut. 2. make 4 Pills.

Lately, a Woman afflicted with a most painful Ascites, and most desperate, as it seemed to me, the ensuing Medicine being taken for 6 days successively, she began to be much better, and in a short time afterwards recovered her health entirely.

Take of powder of Gum-gutta twelve grains, Oyl of Cinnamon one drop, with syrup of Buck-thorn, make a Bolus, the dose daily to be augmented, ascending from twelve grains to twenty.

Take of our Tincture of Gum-gutta one scruple, water of Earth-worms one ounce, Syrup of Rhubarb half an ounce, mix them, and let it be taken with government.

2. Whereas there are several species of Spurge, or *Tithymalus*, and all of them work more violently either by Vomit or Stool, by reason of the notable provocation they make in the bowels; and for that cause do abundantly bring out serous humours; yet by reason of the too outrageous force of many of them, the lesser Spurge for the most part only is now in use, and the preparations thereof most of all magnified are, the powder of the bark of the Roots, and the Extract, and we think fit to add the tincture inferiour to none of the rest.

Take of Spurge with the Roots cleansed four handfuls, Lignum-Aloes and Cloves, of each one dram, bruise them and boyl them in four pound of Spring-water, to half, the strained Liquor clarify by separation or settling in a long glass, afterwards evaporate the clear liquor in a Bath heat, to the consistence of an Extract, the dose one scruple.

Take of this Extract half an ounce, pour upon it into a matras of the Tincture of Salt of Tartar 6 ounces, digest them in a Sand-bath to the Extraction of a Tincture, the dose from 20 drops to 30 in a convenient vehicle.

Take of the Powder of Spurge from seven grains to ten, Cinnamon half a scruple, Salt of Tartar eight grains, mix them together in a glass mortar, give it by it self or mixed with a fit Conserve, or Syrup, make a Bolus or Pills.

2. Precipitate of Mercury with Gold, or the Hercules of Bovins which is much extolled by the Author for curing Dropsies; it is described in a former Treatise in the Chapter of Vomits, and the manner of preparing, and the working thereof, and the Reasons are there delivered. This Medicine, inasmuch as it twitches the stomachical fibres by its acrimony, and pours out the blood by reason of the mercurial and salt particles, causes or stirs up a fierce Vomit, and thereby causes the serous humours, violently strained into the Cavities of the bowels, to be ejected.

3. The Pills called *Lunares* produce the same effect in like manner, by reason of the

the vitriolate particles of Silver sharpened with other saline menstrooms, viz. by wrinkling of the fibres of the Bowels very much, they force the serous humors to be strongly strained into their passages, and so to be evacuated.

A Solution of Silver made in Stygian water, and well cleansed, and by a little evaporation is reduced into pleasant Crystals, which by themselves (or with an addition of Salt Nitre to abate the fierceness of the Lunar Vitriol) are made into Pills with crumbs of bread: the dose is one Pill, sometimes two or three, respecting the ability of strength and working. Medicines of this kind are exhibited sometimes with success in a strong constitution, and bowels strong, and a good habit; but they are scarce ever conveniently or rarely without prejudice taken by tender and cachectical persons.

Hydragogues meerly or chiefly purging, are either of a more mild sort, as Elder, Dwarf-Elder, Soldanella, and juice of English Orris, which seldom being administered by themselves, do want the stirring up of sharper Medicines, and on the other side they blunt their too much fierceness; or they are of a stronger sort, as Gratiola or Hedge-hyssop, Jalap, and Elaterium.

The seeds or grains of Elder and Dwarf-Elder being dried, are reduced into a powder, which being taken to the weight of one dram, doth gently bring forth serous humours by siege; Water and Spirits are distilled of the juice of either sorts of Berries fermented, also Robs and Syrups are made of them; which with many other Preparations of those Vegetables, are much magnified for all hydropical Distempers,

Soldanella and Gratiola, are rarely used by themselves in our age, neither are any neat and very efficacious Medicines prepared out of those Simples; they are frequently mixt with certain other Hydragogues, and chiefly are ingredients in compounding Apozems.

The Juice of English Orris is a very profitable Medicine, and because to be easily procured for the Poor, is the more to be esteemed: It is given from six drams to an ounce and a half, or two ounces, either by it self in a fit vehicle, or with other things appropriated thereunto. Jalap is a most known Medicine against every Dropsie, and common enough. And one of the common People suffering under that disease, presently takes of the powder of the root of Jalap a Pennyworth, mixt with Ginger and White-wine, and the desired effect doth frequently follow this remedy used with intermission.

Elaterium is rightly esteemed the most powerful Hydragogue, for that it most painfully provoking the splanchnick Fibres, and together melting the blood and humours by a certain corrosive force, compells whatsoever serosities the Coats of the Bowels, Membranes, Vessels, also the Glandules, and flesh do contain in themselves, to be poured out into the cavities of the Stomach and guts: by which Medicine happily working, the asswaging of the Abdomen doth sometimes succeed. Truly this is the chief weapon of the Empirical Magazine against any Ascites; which they notwithstanding using in all cases, do oftener administer to the hurt than benefit of the Patient: the dose is from three grains to ten or fifteen, taken either by it self, only with correcting spices added, or it is given with other hydragogues in form of a Powder, Pills, or Electuary. The tincture and essence of it are extracted with Spirit of Wine, or with tincture of Salt of Tartar.

These are the chief simple Hydragogues, from which being prepared with the addition of others, many compounded ones as well Magistral as common in Shops are made, and are every where in use; moreover, very many more might be prescribed extemporarily, as occasion serves. Of these we will here annex a few more select forms, and chiefly those that are taken in the form of Potions, Powders, Electuary and Pills.

Take of Dwarf-Elder, English Orris, of each an ounce and half, leaves of Soldanella and Gratiola i. e. Hedge-hyssop of each one handful, Asarum, and Asse Cucumber-roots of each two ounces, roots of lesser Galangal six drams, choice Jalap half an ounce, Elaterium three drams, Cubebs two drams, shred and bruise them, and pour upon them three pound of small Spirit of Wine tartarizated, digest it stopt close in Sand for two days, strain it clear and depurate it by settling. The dose from two spoon-fuls to three, in a convenient vehicle.

Take of Elaterium, Soldanella, Ginger, of each one scruple, Galangal, Cloves, Cinamon, Powder of each half a scruple, Salt of Tartar fifteen grains, make a powder for two doses.

Take powder of Jalap one dram, Ginger one scruple, Cream of Tartar 15 gr. make a powder Pills to be given in a draught of White-wine.

Take of Rhubarb one scruple, Elaterium 5 grains, Tartar vitriolated half a scruple, Spicknard three grains, with Syrup of Buckthorn make four Pills.

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Pilula Lunares.

Purging Hydragogues.

Elder and Dwarf-Elder.

Soldanella.

The juice of Orris.

Elaterium.

The forms of Hydragogues.

A Tincture.

Powder.

Pills.

Take

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Take of Pill Aloephagina half a dram, Elaterium half a Scruple, Oyl of Cloves gr. 3. make four Pills.

Bontius hydropick Pills are given from half a scruple to half a dram, prepared thus :

Take of Aloes two drams and a half, the preparation of Gum-gutta one dram and a half, *Diagridium* corrected one dram, Gum Ammoniacum dissolved, one dram and a half, Tartar vitriolated half a dram, make a mass, and form it into Pills.

Electuaries.

Certain hydragogue Electuaries are now every where in use, and celebrated by practitioners. Of which fort are, 1. One described by the renowned *Sylvius*, and the other by *Zwelfer*, This following pleases us.

Take of Resine of Jalap two drams, Tartar Vitriolate one dram, Extract of Rhubarb two drams, of Spurge a dram and a half, lesser Galangal one dram, beat them in a mortar, and lastly add of Conserve of the flowers of English Orris, four ounces, and with Syrup of Peach-flowers make an Electuary, the dose from half a dram to a dram and a half, or two drams.

2. Diuretick
Hydragogues.

I might here set down or describe many other purging Hydragogues, but Catharticks do not always cure an Ascites, yea oftentimes exasperate it, and (if they be long continued) render it incurable; hence it is necessary to have recourse to other Remedies for the Cure of this disease. Wherefore, let us next enquire whether Diureticks do here profit or not?

And truly any one may easily think that Remedies moving Urine conduce very much for draining waters out of every place or cavity of the body. In truth it is manifest by frequent experience, these do often cure an Anasarca before any other Remedy; let us see what they may effect for the emptying the Cavity of the Abdomen.

What Profit
they bring in
an Ascites.

As to this it first appears, that there is no passage immediately open from an Ascitic pool to the Reins, although contiguous; but that whatsoever waters are transferred from hence thither, must of necessity first be drunk up in the mass of blood, and from thence be poured out of its bosom into the sink of Urine; and truly it is but a little which the gaping little mouths of the yeins about the superficies of the bowels can receive (if perhaps they are open at all) and Diureticks can but effect this one thing, that by pouring forth the blood, and forcing its serosities more plentifully to the Kidnies, they cause the waters fluctuating in the belly to be allured to it being so emptied; in the mean time there is no less danger, lest Diureticks being unseasonably administered, while they dissolve the blood too much, they constrain the serum to depart into the seat of the Ascites, more than into the Reins, and so rather augment than remove the inundation of the belly. For that it sometimes so happens, I have often found by experience; wherefore when Diureticks are prescribed to cure an Ascites, we must chiefly provide against such a contrary effect. For this reason indeed Astringents and Corroboratives are always mixt in Remedies for the Dropsie (founded on experience, and the Authority and Practice of the Ancients) not that such (as is commonly said) do confirm the Tone of the Liver, but conserve the temperature, and mixture of the blood, lest it be wholly dissolved by too great a fusion. Wherefore in an Ascites which chiefly or in part happens by reason of the frame of the bowels and vessels, and chiefly the Coats, Glandules, and their little strings, and their interspaces being stuffed by a serous humour, and therefore very much swell'd up, as Catharticks so also Diureticks profit, and are frequently taken with success; forasmuch as by the use of these the mass of blood being emptied, (the serum being more plentifully derived to the Kidneys) doth easily receive unto it self those waters every where stagnating about their little mouths, and conveys it towards the urinary sink: but on the contrary, in a meer Ascites where the heap of waters do overflow the Cavity of the Belly, the Textures of the bowels being free from the serous stuffing; Diureticks are given in vain, or incommodiously; inasmuch as they express nothing from this Lake of the belly, and most frequently by dissolving the blood more impetuously drive together the waters apt to be instill'd there.

With what
choice and difference they
ought to be administered.

Not all Diureticks of every kind are equally convenient in an Ascites, neither ought they indifferently to be administered; for we must observe, the affected in this disease for the most part make a little, reddish Urine, and as it were lixivial; which truly is an indication that the temperature of the blood is too much bound in them

them, by reason of the fixt and sulphureous Salt exalted and combined together : and therefore that the Serum is not duely separated within the reins ; which notwithstanding is shook off about the windings of the obstructed bowels, and so is deposited in the Cavity of the Belly. Wherefore in this Case it will be convenient to drink only those things to excite Urine, which so restore and amend the Constitution of the blood, that the enormities of the fixed Salt and Sulphur being taken away, the ferous part might be separated within the reins, and more plentifully discharged ; for which purpose, not acid or lixivial things, but those endowed with a volatile Salt are appointed. For I have often observed in Patients of that kind, when the Spirit of Salt, and other acid drops of Minerals, and when the Dissolutions and Deliquiums of Salt of Tartar, Broom and other things, have done more hurt than good, that the Juice of Plantane, Brooklime, and other Herbs abounding with a volatile Salt, have much helped, as also the expressions of Millepedes : for the same reason Salt of Nitre thoroughly purified or Crystal Mineral doth often profit. Forms of Medicines more accomodate for this use are extant in our former Treatise, where, viz. examples of Diureticks are described, in which both volatile and nitrous Salts are the Basis. Moreover, hither ought to be referred the notable experiment, by which *Joannes Anglus* affirms himself often to have cured the Ascites from a hot cause, which Medicine also that expert Physitian Dr. *Theodore Mayern* was wont to magnifie and prescribe in the like case.

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John English
his Empyricall
remedy.

Take of the juice of Plantane and Liverwort, and fill an Earthen pot to the top, which being stopp close, put in a hot Oven after the Bread is drawn, and make a little fire on the sides of the pot to continue the Heat of the Oven ; after it is so boyl'd strain it, and being sweetned with Sugar, drink of it Morning and Evening, and it cures. In imitation of this I have often with success prescribed as followeth.

Take of green Plantane-leaves four handfuls, Liverwort, Brooklime, of each two handfuls, bruse them together, and pour upon them half a pound of small compound Radish-water, or other appropriate Magistral, express it strongly, the dose three ounces three times in a day.

Although Diaphoreticks are most efficacious in an Anasarca, yet in an Ascites they are rarely or not at all used : for being unseasonably offered, they impress oft-times great hurt on the Patient without any avail ; forasmuch indeed as by heating the blood, they cause the fluctuating waters to grow hot, and as it were to boyl in the hollownes of the belly ; so that the spirits and humours are disturbed by vapours raised from thence ; and so a disorder of all the functions follows, and the very bowels being as it were boyled, are much prejudiced. Moreover from sweating unadvisedly instituted, the blood being forced into a fusion and precipitation of the Serum throws it off the more into the nest of the Ascites. Wherefore when some prescribe fomentations, and liniments, and bathing, to be applyed to the swelling Paunch of the Belly, for the most part it turns to the worse in such Patients ; for besides a little Feaver, a Vertigo, fainting of the spirits, and other ill symptomes of the brain and heart, being most frequently so raised, even the belly also doth from thence swell the more : forasmuch as the Blood being agitated and poured out, deposits in that place more largely the Serum ; and for that cause the mouths of the Vessels are more loosened and opened, so that they may more readily let fall water prone to depart from the mass of blood. But the Remedies which are chiefly wont to be administred with success near the places affected (when a Cure is intended without a Paracentesis) are Clysters and Plaisters.

How beneficial
Diaphoreticks
are in an Ascites.

The former draw the Serum out of the Vessels and Glandules of the Guts and Mesentery without fusion of the whole mass of blood, (which the stronger purging Medicines do excite,) which being so emptied do imbibe a little the extravasated Lympha. For this purpose the ensuing Clyster, wont to be prescribed by us in this case, is most fit, in regard it contracts the intestinal fibres together, and draws the Serum imbibed by the blood, or contained formerly therein, towards the Reins.

Clysters and
Plaisters.

Take a pint of Urine of a sound man that drinks Wine, Venice Turpentine dissolved with the Yolk of an Egg, an ounce and a half, Sal Prunella one dram and a half, make a Clyster, which repeat daily. Sometimes Plaisters yield help in an Ascites, yet let them be such, as by a certain restrigent and comfortable virtue strengthen the bowels and bind together the mouths of the Vessels, lest they too much spue out their serosities : for this purpose, I use to apply the Plaister *Diasaponis* with success. Or,

Forms thereof

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Take of the Plaister of Minium, Paracelsus Plaister, of each what suffices, make a Plaister to be applied to the Abdomen. If this disease is accompanied with a Tympany, Epithemes of another manner are fit, as we shall hereafter declare.

When and to whom a Paracentesis is convenient in an Ascites.

The great and most present Remedy of an Ascites, is, that the waters may be drawn out by a Paracentesis being made; which administration however doth not oftner cure the disease, than kill the Patient; wherefore there is need of exact caution to whom, and at what time of the disease it ought to be administered: to persons of an ill habit, who have been long ill, in whom the conformation and temper of the bowels is wholly depraved, it will be in vain to have the Lympha drawn out by the Paunch being pierced; for thereupon immediately the Spirits faint and the strength is dissolved, and after a while a new illuvies of the morbidic humour succeeds. But those who being formerly of sound bowels, and healthful enough, as to other parts, when they fell into an Ascites from some great and evident cause, as we are not at first presently to make a Paracentesis, so neither if it be needful ought we to defer it too long: for an incorrigible depravity of the Bowels is contracted by a longer delay, while they remain a long while drowned, and as it were boyled in water.

It is beside our purpose to describe here the administration of a Paracentesis, whether it be done after the ordinary manner, or by a hollow Needle according to *Sylvius*; this part of Chirurgery, as dangerous, when Physicians seldom prescribe, yet Quacks and Empiricks rashly and unluckily essay it, Artists not being consulted: we will relate here for conclusion the History of a true and huge Ascites, lately cured without any Paracentesis.

A history of a cure.

A young Woman wife to a Merchant, being slender and proper, while she gave suck to her Child, to encrease her milk day and night did immoderately guzzle one while plain Ale, another while Posset drink. After having used this kind of dyet for a fortnight, she contracted a vast Ascites in a short time, the beginning whereof she was not in the least sensible of; for her Abdomen being great with water fluctuating within, did much swell up, and its bulk when she turned from one side to the other, fell without the Ileon and borders of the rest of the body: when in the mean while the flesh of all her Members was very much consumed, that she seemed no less in a consumption than a Dropsie.

The Child being weaned, and a better course of Diet being appointed, she betook her self to Medicines, and took in the first place the more mild Hydragogues, as well purgative as diuretical, but without any advantage; also she was worse after every purge; but being committed to our care, and almost desperate, I handled her after the ensuing method.

I prescribed these Medicines, for the most part forbidding Ale, and any potent liquor (medicines excepted.)

Take of the leaves of Plantane, Brooklime, Clivers, of each 4 handfuls bruised, and pour upon them of water of Earth-worms and Rhadish compound of each three ounces, press them, take it twice aday, viz. at Eight in the Morning, and at Five in the Afternoon. She continued long in the use of this Medicine, but did sometimes vary the Composition, sometimes changing the herbs, sometimes the Liquor poured on them.

Take of the reddest Tincture of Salt of Tartar an ounce and a half, she took 20 drops at night, and early in the morning, in two spoonfuls of the following Julep, drinking seven spoonfuls after it.

Take water of Elder-flowers, Saxifrage, of each six ounces, water of Snails, Earthworms, and Rhadish-compound, of each two ounces.

She wore a Plaister of Minium and Oxycroceum upon her Belly.

The following Clyster was given first daily, afterwards every two or three days.

Take Urine of a healthy man one pound, Turpentine dissolved with the Yolk of an Egg an ounce and a half, Sugar an ounce, Sal Prunella one dram, make a Clyster.

By the constant use of these things her Belly asswaged within a fortnight, but her flesh daily wasting, a Consumption was threatned. Wherefore, going into the Countrey to avoid this, she drank Asses milk; by the benefit of which Nutriment and of purer Air, continually taking the above-mentioned Medicines, she recovered her entire health within three or four weeks, and lives yet in health.

SECT.

SECT. II. CHAP. IV.

Of a Tympanie.

A Tympany vulgarly, although not properly, is esteemed a kind of Dropsie, from which rank, *Prosper Marrianus* alleading the testimony of *Hippocrates*, rejects as well this Disease, as an Anasarca. But the former infesting the region of the Abdomen, and raising it up into a bulk, now comes under consideration next after an Ascites, (to which it is something a-kin) : where first of all it is obvious, that this Disease as it is most difficult to cure, so also to be known; for although its outward form, viz. a somewhat hard swelling of the belly, very stiff and yielding a sound like a Drum, upon touching it, is evidently perceived by many senses together; notwithstanding what may be the morbidick matter inducing that Tumour, or after what manner it is generated in the belly, or from what place it comes thither, is altogether unknown: therefore those who have a Tympanie, as though they were big with wind, are ignorant both of the manner and time of its conception. Truly I therefore judge the nature and causes of this disease to lye concealed, because whereas its first beginnings are not observed, it suddenly augments prodigiously; so that they who are affected, do scarce sooner perceive themselves to be sick, than that they are become almost incurable. Moreover, a Tympanie, its station being accomplished, degenerating into an Ascites, or rather procuring it to its self, seems to lose its own nature; and truly after death Anatomical inspection scarce discovers any thing more in bodies dying with a Tympany, than with an Ascites. But that many Physical Authors do readily declare this Distemper to be raised by wind enclosed within the cavity of the abdomen, doth not at all satisfy a mind desirous of the truth; because it seems altogether improbable that winds should be produced so suddenly, and in so great plenty in that place; or admit they were, that so hard, unmoveable and constant a tumour should be raised.

A Tympany not properly a kind of Dropsie.

Wherefore its cause is occult.

Commonly ascribed to Wind.

Moreover they do not easily agree concerning the seat of the disease, where the wind is supposed to be included; for some affirm that this place is determinate in the concave of the Peritonæum, and by the convex superficies of the Intestines, and other bowels of the lower part of the belly; but after what manner such a heap of winds can be therein collected, in my opinion it cannot be manifested by any reason, example, or parallel instance. Besides, if the case were such, it might be more easily cured by pricking, than an Ascites by a Paracentesis; which yet I never heard accomplished. *Helmont* reports a stinking wind was vented by a Paracentesis, in one esteemed Hydriopick; that suddenly his Abdomen funk, and the man dyed immediately. But *Placerrus* and *Smerius*, no less worthy of credit, do affirm, *They discovered in some who were thought to have the Tympanie, and dissected after death, that no wind broke forth out of the hollow of the belly, neither that it fell, but that especially the smaller guts being distended, and strutting with wind, burst out so, that they could not be put up again into the same belly.*

Authors do not agree about the seat of the Winds.

Not without the guts in the cavity of the Abdomen.

But truly neither is this observation an argument to me, that the cause of the disease (of which we treat) remains within the Cavities of the guts, and that the winds accumulated in that place, do often or most of all raise a Tympanitick swelling of the belly. For besides that, a disease taking rise from such an occasion, would not be so immovable, and frequently incurable; moreover, I am induced to think, that the Intestines are not so greatly dilated by winds shut up in them, but that they often of their own accord swelling out, give occasion to those winds consequently and secondarily to be produced, by which the spaces enlarged might be filled, as we shall by and by more clearly demonstrate.

Nor within their passages.

But what is asserted by others, that the winds which are the cause of a Tympany are engendred amongst the Coats of the Mesentery, and Guts, seems yet much more improbable; because when there is no cavity in that place preexistent, after what manner can the winds so tear those parts, and separate them from one and another, so that from such formed Dennis, the whole region of the Belly should grow into so vast a bulk by accumulated winds there laid up? Certainly so many and so great divisions could not be made without continual torment and most sharp pains.

Not between the coats of the bowels.

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By what and how many causes the Belly swells.

1. From tumours of the bowels in that place.

2. From waters gathered as in an Ascites.

3. From winds.

4. From the inflation of the Fibres, by reason of the Spirits being disturbed.

An Affection of what sort a Tympany is.

Its cause and formal reason explicated.

Wherefore, omitting these opinions already spoken of about a Tympanie, let us proceed another way to the more assured searching out its Pathologie; viz. by thoroughly weighing by what means, and by what evident causes, the Abdomen is wont to swell up. Wherefore, we advertise there are four kinds of things contained, from which proceeds a tumour in the nether Belly of the living, (why the Abdomen swells in dead persons, the reasons follow hereafter) which kinds, are, solid, humid, wind and Spirits.

First, It is obvious enough, that the inward tumours of the bowels, viz. scirrhus, strumous, cancrus and glandulous, and some perhaps of another kind, when they rise to any notable bulk, do swell the whole belly; yet in the mean time as long as they are simple, and new, they may be perceived and circumscribed by the touch; yet afterwards growing inveterate, they cause other evils to the neighbouring parts, yea over the whole Region of the Abdomen. Truly these as they are sometimes the procuring cause of an Ascites, so of a Tympany from the beginning, to which afterwards for a complement of either disease, another conjunct cause gains access, viz. an illuvies of waters, or an irregularity of the Spirits.

Secondly, a watery humour gathered within the Cavity of the abdomen, or being impacted in the membranous or glandulous parts thereof, frequently produces an Ascites, the reasons whereof, and the manner of its coming to pass, are at large set down before.

Thirdly, Winds within the bowels of Concoction being raised from crudities, ill concoction, or fermentation of heterogeneous humours, do frequently puff up the Cavity of the guts, and for the most part produce a short and transitory tumour of the belly. For the fermentation of the Juices ceasing, and eruption of wind being procured, immediately succeeds an allwaging of the Belly. To this cause, both the Colick and Tympanie, not only by the vulgar but by Physicians of great note are imputed; but in our judgement, when it is solitary it produces neither of these distempers.

Fourthly, There yet remains another sudden, and vast swelling of the belly, which the animal Spirits (not for nothing styl'd by Hippocrates violent) seem to procure. For when these in heaps, and inordinately, rush into the nervous fibres belonging to the bowels of the lower belly, presently the parts that these weave together are caused to be puffed up, and extended every where round about. For truly, from this cause (as we have often shewed in another place) a swelling, and as it were a tympanitical puffing up of the whole abdomen, as well in the Colick as in Hysterical fits vulgarly so called, doth often happen. And truly these distempers are so allayed to a Tympany, that they frequently end in it; for I have oft observed, that those who have been obnoxious to the Colick and hysterical passion long and grievously, unless they receive cure, do become Tympanitical. And then the greatest of the difference will be, that the swelling of the belly, which before was a wandering Symptom, and soon passing over, at length grows to be a fixt and permanent disease.

Wherefore, it seems material in this Case, to accommodate the Aetiology of these passions delivered by us in another place, to unfold the Nature and Causes of this present maladie.

Which truly will not be of any great business or difficulty. For supposing (what we have in another place more largely set down) the extensions and inflations of the membranes and hollow bowels, take their origine from the impetuous invasions of the Spirits into the nervous fibres (of which they are interwoven) it will be obvious enough to conceive even a Tympanie to be produced from such a cause, but being more fixt, and longer or uncessantly in the act; into the reason of which difference, we will by and by inquire.

In the mean time I am induced to believe a Tympanie not to be stirred up from winds shut up within, or without the Cavity of the guts, (for such an accumulation of winds in those places, is an effect, but not a cause of this disease) but that it does arise, inasmuch as the animal Spirits, in the bottom of the belly, belonging to the membranous bowels, being forced into disorder by something incongruous, do tumultuously rush every where into the nervous fibres, and puff them up, neither do they immediately recede back from them: from hence the Peritonæum swells, and the guts being blown up and enlarged, they are as it were inflated, the Mesentery, and other membranous bowels, being turgid with an impetuous Spirit, are as it were raised up into a bulk; moreover, while these come thus to pass, that the vacuities caused from the swelling of hollow Bowels might be filled, a portion presently of every humour within contained, being rarified into vapours, forthwith turns into wind, wandering about those empty spaces.

Truly, we have clearly enough shewn, by reasons and instances in our Pathologie of

of Convulsions, that the animal spirits puff up the membranous parts by their irregularity, and so produce as it were this windie Distemper. Moreover the same is demonstrated by Anatomical observation made in dissecting a living Creature; viz. inasmuch as the Trunk of the eighth Pair of Nerves descending on each side by the Neck, if it be taken out and bound with a thred, forthwith all the stomach swells up, as if it were puffed with wind; which certainly can proceed from no other cause than that the animal Spirits of the fibres of that bowel, and others flowing through the nervous passages, (inasmuch as they being cut off from their origine, are driven into confusion) do tumultuously enter those parts, and puff them up. Besides these, for the further illustrating of this Hypothesis, I will relate a History cited by the most renowned Smetius, of an universal Tympany (as he calls it) in a certain young man of Liege: *Who when he had received, in a conflict, under his right arm-pit, a wound, made by a prick, penetrating into the Cavity of his breast, next day and night being past, he appeared in the morning after swell'd throughout his whole body, not only in his breast, but also in his back, belly, loins, and in the cods, besides both in his arms, shoulders, neck and face, that he could not open his eye-lids, also on the crown of his head, the skin being every where swolne and tumefied, the tumour was every where extended with great pain.* The Author calls this wonderful affection, an Universal Tympanie. The most renowned Sennertus relates a Case like this from his own knowledge: Moreover, I remember I have heard or read of the like from a wound of the breast being received near the arm-pit.

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And proved by
arguments and
instances.

An universal
Tympanie.

Notwithstanding, the reason of this Symptom, deliver'd by Smetius, and approved by Sennertus, doth not at all please me: for they ascribe the cause of that general Tympanie, to the puffing up of the breast, by the axillary wound, made all that night under the skin, as we see a new and moist bladder to be blown up by boyes with a quill: which truly doth not only seem improbable, but also we think scarce possible, that the wind to be blown out of a wound of the Thorax, by reason of the hole one night stopt, can enter the skin, and from thence passing through the whole body, should make it become every where Tympanitical: For besides that the wind cannot so suddenly pass from thence into all parts, although it should be blown with a quill from the mouth, under the skin; besides, while the orifice of the wound is stopt, no wind can altogether be blown out from the Cavity of the breast, because none in the mean time enters. But assuredly the cause of that wonderful affection is this; (whence also the formal reason of a Tympanie is illustrated) In the Breast near the Arm-pits, are many and eminent foldings of Nerves, (as we have described in our Treatise of Nerves,) by which the nerves of the whole body communicate among themselves: viz. the Trunk of the eighth Pair unites with the intercostal Nerve, and both with the nerves of the Spina Dorso, by branches and sprigs sent here and there. Wherefore, this nervous folding, perchance being pierced by the point of the Sword, first of all the spirits residing in that place being provok'd, run into disorders, afterwards a consent being immediately made thorow so many notable Nerves, and transmitted to and fro every where, other Spirits, and then again others, are sensible of the like irregularities, and puffing up the membranous and nervous Fibres (which every where they enter tumultuously) they induce as it were a tympanitical affection through the whole body. By reason of the like fury or virulent madness imposed upon the Spirits, in any place, and from thence immediately diffused far and wide, certain Poysons being drunk, the strokes of weapons, or of wild Beasts, or a venemous bite, do frequently induce a swelling together of many parts, or of the whole body; which swelling distemper of the Spirits, is styl'd by Helmont to be *Indignatio Archaica*. There are many other Cases and Instances, by which it is most clearly evinced, that the Animal Spirits being provok'd and driven into angry inclinations, inasmuch as they do more impetuously enter into the nervous Fibres, are wont first to swell the membranous parts, and to excite many passions out of those, which are vulgarly but falsely ascribed to winds: so that in truth no other cause of a Tympanie can be assigned more like truth.

The Cause of an
universal Tym-
panie enquired
into.

The true cause
assigned.

If it be objected, that the Paunches of the defunct after some time are raised by wind into a bulk, and swell like as in a Tympany: I pronounce this to proceed from the putrefaction of humours, and the extreame dissolution of the mixture, wherein all the active particles depart, being freed one from the other, and flying about seek vent in every place, and distend greatly all obstacles, and chiefly the sides of the Cavities, (which doth not at all happen in living bodies;) wherefore, as all Carcases do not putrifie alike, so their bellies swell sooner or later, more or less: But while life endures, no rottenness or dissolution of particles is made in an animated body, that can bring about a splanchnick fermentation or swelling. In the mean while we deny

why the belly
swells in the
dead.

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deny not, that winds are generated within the offices of concoction, sanguification, and separation, yea within all the particular cells and recesses of our whole body; notwithstanding from them all, unto the winds wheresoever engendred (whilst the Spirits have their due influence, and actuate the nervous as well as moving fibres, that the fides of the bowels be not kept distended and rigid) an easie vent does every where lye open. And the truth is, in a Tympany, we allow the wind to fill up the empty spaces, but the spirits, inasmuch as they extend the bowels by their irregularity, do first cause those vacuities, (wherein the winds secondarily and consequently are engendred) and they (inasmuch as the same bowels are still kept struted and distended) do hinder those winds from being removed.

The Animal Spirits and not wind the cause of the Tympanie.

And now I judge it is plain enough by what we have said, that the animal spirits rather than the wind do raise swellings of the belly in that sort; at least such short and transitory ones, as happen in Hysterical and Colick fits. Notwithstanding there yet remains a great difficulty, after what manner the Tympanitical swelling of the Abdomen, which is fixt and permanent, yea for the most part immoveable, can proceed from any such cause; especially, because the Animal Spirits being of their own nature active and very apt to motion, do for the most part so affect removal, that unless they be wearied or become defunct, they scarce ever lie still.

That I may loosen this knot by reasoning, it becomes us to consider the Nervous Juice together with the substance of the Animal Spirits, which is every where a vehicle to them, and also a bridle: for the Spirits enjoying the most subtile stream thereof, do freely expatiate, and lest being dissipated from one another, they might fly away, they are contained in an entire series. When therefore that Juice is faulty as to its temper or motion, immediately the animal spirits become diversly delinquent, or are prevented in the exercises of their functions, as we have at large expounded in our Treatise of Passions. And lest by repeating them now I should make long Preambles, I will contract into a few words what belongs to the present purpose.

This happens by the fault of the Nervous juice.

Wherefore in the first place, it is to be observed, that the contents of the nether belly (excepting only the Liver, Spleen, and Kidneys) are furnished with many membranous bowels, (which the nervous fibres for the most part weave together) whence it follows that the nervous Juice (whose journey is longer, and the passages straiter in these parts) doth find here many remora's: which also may be proved from the effect, forasmuch as the convulsive invasions, every where stirr'd up in the Hypochondriack Colick, Nephritical and Hysterical Passions, do so grievously infest the Abdomen. When therefore that Juice watering the nervous fibres of these parts, shall be either viscid or tenacious of it self, or fill them with very many feculencies, for that cause it will come to pass, that all the animal spirits will not easily return from thence as oft as they are hurl'd into these fibres, in some part obstructed: and when in this manner there is a full incursion, and a small return of them, at length it will happen that great abundance of the spirits remain in these fibres every day more and more impacted, and hold them alwayes distended and very much puff'd up; and at length by reason of the ways of their ingress and regress in those fibres being obstructed, they become immoveable in that place, and keep the affected parts always extended and stiff: in the mean time because these Spirits there impacted within the nervous passages, and cramm'd thick, have commerce with others that flow to them in their dens, therefore the affected part although it be stiff and almost immovable, yet however enjoys sense. This Pathologie although it may seem to some a Paradox, and uncouth, I doubt not but it will deserve assent from many, if it be thoroughly weigh'd, that those who have been a long time obnoxious to Hypochondriack Colick, and other convulsive distempers of the nether Belly, do at length become sick of a Tympany.

By the obstruction whereof the Spirits within the fibres are detained and made immoveable.

The formal reason and conjunct cause of a Tympanie being delineated after this manner, before we proceed to trace out diligently the more remote causes thereof, it may be lawfull for us from what we have said to deliver a definition, or at least a certain description of this disease, viz. *That it is a fixt and constant Tumour of the Abdomen, equal, hard, stiff, and yielding a noise upon striking, taking its origine from a convulsive inflation of the parts and membranous bowels, by reason of the Animal Spirits being driven into those fibres in too great abundance, and through the fault of the nervous juice obstructing, being hindered from their return back; to which disease consequently an accumulation of winds in the empty places, accrues as a complement.*

A description of the disease.

Its procuring causes.

As to what appertains to the procuring and evident causes of this disease, it very seldom happeneth that they are altogether observed, but that insinuating it self by silent beginnings, it frequently is finished, or becomes deplorable before it is perceived; insomuch that against this disease scarce any antidote can be appointed; for while the ordinary functions are not much prejudiced, the swelling of the belly is presumed

presumed only to have its origine from wind, and while it is expected to vanish spontaneously, it often grows into a Tympanie. Wherefore that we may have timely notice of its beginning, we may take notice, that some previous affects dispose to it; of this sort is first an Hypochondriack, Colical and Hysterical disposition, yea and sometimes an Asthmatic; whose fits when they are used to be frequently raised, if at length a tumour of the Abdomen follow it, though it be small in the beginning, a Tympany forthwith may be feared. Of the former of these affects cases every where are to be met with, and stand fair to common observation: of the later Scherichius reports, *That a man of Sixty years of age was infested with this symptome some months before his Belly was swell'd into any manifest tumour, that as often as he sate at meat, beginning to eat, also when composing himself for sleep, he began to sleep soundly, he was surprized with such a difficulty of breathing, that the frequency of it threatened the danger of choaking; at which time also he perceived a certain palpitation about the Hypochondria, as if some living Animal were underneath the midriff; this distemper afterwards ended in a Tumour of the Abdomen, by which he died.* In this and others cases now cited the same reason holds, viz. that the animal spirits being used to make irregular excursions into the nervous Fibres of the lower belly, at length do not only more often and abundantly enter into them, but being impacted and hindred they abide in them, and so at length induce tympanitic inflations of the bowels. Truly this morbid beginning happens sooner or later, if thereupon do come the evident causes, which disturb the Spirits in the bottom of the belly, and compel them to frequent disorders, and also do either stop the motion or prevent the temperature of the nervous Juice flowing within those Fibres; in which rank are accounted irregularities in the six Non-naturals, immoderate Passions, and chiefly of grief, and usual evacuations suppress'd, drinking of cold water after some great heat, or any sudden cold induced on the belly, either from air or water.

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Other previous
convulsive af-
fections.

The case of an
Asthma ending
in a Tympanie.

The evident
causes of this
disease.

As to the Prognosticks, this disease is always accounted of so bad an omen that commonly the name is abhorr'd, insomuch that frequently when there is no suspicion of ill from the tumour of the belly, if perhaps that swelling be call'd by the Physitian, a Tympanie, forthwith it is concluded desperate. Notwithstanding this Disease rarely kills of it self, but being protracted a long space of time, that it may at length more certainly kill, it gains to it self an Ascites, as an Harbinger of Death. That we may search into the reason thereof, it will be obvious enough to conceive, while all the bowels are distended in the lower belly, and are held as it were stiff, the passages of the blood, and nervous and lymphatic humours, being too much extended, or compressed are much straitned, and for that cause cannot freely and readily transmit its Juice; from whence it follows that every humour being straitned in the passage, that at length it may pass by some means, it shakes off a certain serosity from its mass wherever way is given; and those droppings of the humours falling into the hollow of the Abdomen, excite an Ascitick Dropsie.

The Prognosticks
thereof.

What relates to the Curatory part of this Disease, the whole scope of healing is commonly bent against wind, viz. Indications inculcated by practical Authors suggest the matter to be evacuated, from whence the winds are raised, and to remove the cause that lifts them up, and the winds to be discuss'd and dissipated, which do already distend the belly.

The Cure.

For these ends Purgers appointed against the humour chiefly suspected are wont to be prescribed with great confidence, although with small or ill success; that is to say, Phlegmagogues so called, another while those that purge Melancholly, another while those that purge Cholera, whereto also are joyn'd purgers of water (as weapons intended against every enemy.) For this disease (as is manifest by our observation) is wont for the most part to be exasperated with strong Purgers, and seldom alleviated; the reason whereof is evident enough, because the nervous fibres being provok't by a sharp Medicine, the animal Spirits renew their irregular excursions, and do every where more and more stretch them out, rather than give any remission to them; wherefore, although frequent and abundant watery and flatulent stools are procured, notwithstanding the Belly swells the more. Moreover, to dispell, discuss, and bridle the wind, there is a more than Æolian power prescribed; Medicines commonly call'd *Carminatives*, almost of every kind or form are sedulously administred, within and without, above and beneath, and upon the part affected; notwithstanding this disease for the most part is untamed by all these; whence we may suspect, that the true cause of the disease lyes as yet conceal'd, because Medicines profit not that are administred, indicated or suggested according to the ordinary Ætiologie or reason of it.

Remedies de-
signed against
Wind profit not.

Although

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3. Curatory In-
dications.

The first Indi-
cation hardest.

*What, and what
sort of Medi-
cines are good
or hurtful in
this Disease.*

*Only mild Pur-
gers and Cly-
sters are conve-
nient.*

*Forms of Medi-
cines.*

*A solutive li-
quor.*

Although I cannot challenge a better success in curing this disease, or a more certain method of healing, attested from experience, notwithstanding in the mean while we will here proffer another way of curing, accommodated to our Hypothesis, and established by reasons strong enough.

Wherefore in a Tympanie, as in most other affections, there will be three chief indications; Whereof the first, and chiefly insisted on, is the Curatory, that by recalling the Animal Spirits from their Convulsive affection, and reducing them into order, endeavors the removal of the swelling of the Belly. The second preservatory which restrains those or other Spirits from their irregular excursions into the lower Belly, and together corrects the faults of the nervous liquor, watering it, both as to its temper, or motion. The third Vital, by removing the Symptoms urging, doth succour and sustain all the functions oppressed or weakened, as much as possible may be.

I. The first Indication is of greatest moment, on which the hinge of the whole Cure turns; but it is most difficultly performed, for it doth not easily appear by what remedies or ways of administration it ought to be attempted, when most weapons or medicines do little or nothing prevail against this inviolable enemy. Phlebotomie assumes no place here, but is declined for the most part as prejudicial; also Catharticks, insomuch as they provoke the affected Fibres, and disturb the Spirits, and hurry them more impetuously, do increase rather than diminish or cure the Tumour of the Belly, in like manner Diaphoreticks impell the Spirits, and the morbidic Particles deeper into them, whereas they ought to be allured, and call'd out of the Fibres. The chief order of healing seems to be placed in Diureticks and the use of Clysters; and also great things are expected from topical Applications, because they are more immediately exhibited to the disease, and as it were by contact, and because they do best discuss Tumours in other places. Yet not all Dissolvents are here fitting, nor those which profit most in other Tumours; for the more hot being given for discussing, whether they are applied by Fomentation, Liniments, or in the form of a Cataplasim or Plaister, oftner afford hurt than succour in a Tympanie; for they both open and dilate the passages of the Fibres, that from thence they may lie more open to the incursion of the Spirits; and also rarifie the Particles impacted, so that while they occupy a larger space, an inflation and intumescency of the Belly is augmented. Lastly, what appertains to Alteratives which succour against other affections of the nervous kind, only a certain few are fit in a Tympanie; for where the morbidic matter sticking within the straiter passages cannot be impell'd straight or throughly, Elastick medicines render the stoppage greater and more fixt, by enfixing the matter deeper; wherefore Spirit of Harts-horn, of Soot, of Sal Armoniack, yea also Tinctures, Elixirs, and other Medicines endowed with a volatile Salt, or active Particles of another kind, do not only acquire heat, and a troublesom thirst in the sick Person troubled with a Tympanie, but also cause the Abdomen to swell the more, inasmuch as they melt the blood and nervous Juice, and stirr the Spirits, insomuch that the Particles deposited by each of these, are compell'd in the parts affected.

But truly although Medicine doth so little avail against this disease, it is not altogether to be neglected, (as if either it affected nothing, or what is ill,) but it behooves us to turn every stone, that by some means we may succour the Patient, and at length may obtain a cure for him, or at least an alleviation. Wherefore in the first place (because it is the custom to begin with Purgatives) although the stronger do ever hurt, and the gentler scarce ever prevail to discharge the conjunct cause, notwithstanding these latter, inasmuch as they do something subtract the nourishment of the disease, also make a way by which other Medicines do exert their powers, they ought to have their turns in Physical practice once in six or seven days; and at the other times let Clysters (whose use is much better) be frequently administred. Hydroticks being prohibited, we must rest upon moderate Diureticks, whereto are adjoyned things respecting the alteration and reduction of the Spirits and Humours, which truly make up the Tympanitical Pharmacy. Moreover in the mean time the use of Topicks is not to be neglected. We will annex certain select forms of Medicines appropriated for every of these purposes. For a Medicine mildly solutive, let the laxative Wine be used, prescribed by the renowned *Greg. Horstius* for a Tympanie, in his Book of Observations, lib. iiij. Chap. xxx. or in its place let the following be prescribed with greater ease.

Take the leaves of Peach-flowers, of Damask-roses, of each two Pugils, Broom, Elder, Centaury the lesser, of each Pugil. 1. the leaves of Agrimony, Roman Wormwood of each one handful, Senna one ounce, Rhubarb six drams, Carthamus-seeds half an ounce, Dwarf-Elder two drams, yellow Sanders three drams, Galangal two drams, slice them and bruise them,

them, put them into a silk Bag in a Glass, with two pound of White-wine, Saxifrage-water, one pound, Salt of Tartar one dram and a half, let them stand 48 hours, let the Patient drink four ounces to six, every third or fourth day.

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In a hotter Constitution let the following form be taken, which I have proved with success in this disease.

Take of purging Mineral waters eight pound, Salt of Wormwood two drams, let it evaporate in a gentle Bath to two pound. To this I use to add four ounces of Water distill'd from Purgers with Wine; the dose from four ounces to six.

Or to the two pound of evaporated water add of Mechoacan, Turbith, of each half an ounce, Rhubarb six drams, yellow Sanders two drams, Cloves one dram, digest them close and warm for two hours: filtre it through Paper, the dose 3 or 4 ounces.

Clysters are of frequent use in this Disease, inasmuch as they loosen the Belly without any great irritation of the Fibres.

Take of the infusion of Stone-horse dung with Cammomile-flowers a pound, Mellis Mercurialis two ounces. After the same manner Decoctions and Infusions are prepared, with Carminatives, from Dogs-dung.

Take of the Emollient Decoction one pound, Sal Prunella, or Sal Armoniack from one dram to a dram and a half; make a Clyster.

Take of sound Urine one pound, Sal Prunella one dram, Venice Turpentine dissolved with the yolk of an Egge, an ounce and a half: make a Clyster.

2. Diureticks if any other Remedies promise help in this Disease.

Diureticks.

Take of Millepedes living and cleansed three ounces, one Nutmeg sliced, bruise them together, and pour upon them one pound of the Diuretick-water prescribed below: Press them strongly, the Dose from three ounces to four twice aday.

Take of green Juniper-berries, and Elder-berries, of each six pound, of Firr-tops four pound, Distilled Water green Walnuts two pound, Cortex Winterani four ounces, the outer Rinds of six Oranges and four Limons, Seeds of Ameos, Rockets Cresses, of each an ounce and half, Dill-seeds two ounces, slice them and bruise them, and add of Posset-drink made with White-wine 8 pound, distil it in common Organs let the whole liquor be mixed.

Take of Crystal mineral half an ounce, Volatile Salt of Amber, two drams, the powder Pills of Carror-seeds one dram, Turpentine of Venice what suffices to make small Pills, the dose Numb. 3. in the evening and morning, drinking after it three ounces of the distilled water.

Take of the sweet Spirit of Salt half an ounce, take six drops to twelve, twice in a day, Spiritu in a draught of the same water, with a spoonful of Syrup of Violets.

Take of Spirit of Salt of Tartar one ounce, take one scruple to half a dram, twice aday, after the same manner; So also spirit of Nitre, and Tincture of Salt of Tartar may be taken. An Expression.

Take of Plantane, Chervil and Clivers-leaves, of each four handfuls, bruise them, and pour on them a pint of the former distilled water. Press them strongly, the dose three ounces, twice or thrice in a day with other Medicines.

Take of Grass-roots three ounces, of Butchers-broom two ounces, Chervil and Eringo Apozems sandied, of each one ounce, shavings of Harts-horn, Ivory, of each two drams, of burnt Harts-horn two drams and a half, Burdock-seeds three drams, boyl them in three pound of Spring-water to two pound, in it strained hot, infuse the leaves of Clivers, Water-cresses, bruised, of each one handful, adding of Rhenish-wine six ounces, make an infusion close and warm for two hours, after strain it again, and add of Magistral-water of Earth-worms two ounces, Syrup of the five opening Roots an ounce, and a half. Make an Apozeme, the dose four ounces twice aday, with some other Medicine.

While these are taken inwardly, also Topicks and outward Applications may be carefully administred; not those which are hot and discussing, but those which are endowed with Particles of a volatile Salt, and Nitrous, to wit, those which destroy the Combinations of other Salts, and dissolve the impactions of the Spirits, for which we propound the ensuing things. If Fomentations ought at all to be admitted into use, let not them be not applied too hot, also let them be prepared not of those that are usually call'd Carminative, but chiefly of Salts and Minerals. Cabrorius (cited by Helmont)

PHAR. *Helmont*) says, That he cured one of 80 years of age, whose Belly he fomented twice aday with a Lye, in which he boyled Salt, Alum and Sulphur, and after applied Cow-dung for a Cataplasim. I use to prescribe these ensuing.

A fomentation. Take of flowers of Sal Armoniack one ounce, Crystal mineral two ounces, Spirit of Wine small and imbued with much Phlegm two pound, mix and dissolve them in a glass.

Let a woollen Cloth dipt into this warm be applyed upon the whole Abdomen, and then let it be changed, wetting it again; let it be done for the space of half an hour twice aday, afterwards let there be applyed a Cataplasim of Cow-dung, with the powder of Dogs turd, or the following Plaister.

A Plaister. Take Empl. Diasaponis, that is, de Minio, with Venice Soap, let it be spread thin upon limber Leather, and applyed to the whole Belly, to be renewed once in ten or twelve dayes.

The second Indication.

Of Chalybeate Medicines.

II. The second Indication requires mostly alterative Remedies, to wit, those which stop the fermentations of the humours in the bowels of the nether Belly, and the Orgasms and irregular excursions of the Spirits, also those which procure equal mixtions and due motions of the Chyle and nervous Juice: for which end Chalybeates are chiefly in use. And truly it is wont not only in this, but in many other splanchnical Diseases, to have resort to the Medicines of Iron, as if from thence to fetch the sharpest weapons; when as many Empiricks and Quacks, who prescribe these things confidently and dogmatically, observe not by what way such a Medicine doth operate, or what alterations for the better may be lawfully expected from thence: wherefore, while Iron, changed into Medicine, although the Sword of Goliath, is snatcht and brandisht by a blind man, it is no marvel if it prove in vain, or if in the stead of the disease, which is an Enemy, Nature it self is sometimes hurt; and truly frequently it happens so, when Chalybeates, of which there is great variety, and diversity of operations, are administered without any choice or difference either of the temperament or constitution in the Patient, and respect to the state of the Disease.

What preparations of Iron are not convenient. Of Medicines prepared of Iron or Steel, and of their vertues and manner of working, we have in another place treated, and there is no need here to repeat the same things. For this disease, if any of them, not all of them are fit; for those in which the frame of the mixture being opened, the Sulphur remains still, and being loosened predominates over the rest, they are altogether to be excluded from this number; for they do much ferment the Juices of the bowels with their notable fermentation, and do so exagitate the Blood and Spirits, that the whole Region of the nether Belly is lifted up into a greater bulk, as if by a certain Spirit thronging violently into it.

Neither here are they fit, from which the sulphureous particles together with the saline are chased away, as in *Crocus Martis* prepared by long and strong Calcination. For this Medicine as it is conducing to stop all fluxes, rather fixes any impaction of Humours and Spirits, and renders them more obstinate.

What sort may be admitted.

But there remains a Martial Remedy of a middle kind, wherein the Sulphur being wholly or for the most part expell'd, a vitriolic Salt remains and predominates: as indeed it is in the solution of the filings of Iron, or in a simple Infusion, or Mineral water, in the Salt or Vitriol of Mars, in our preparation of Steel, with many others; out of which medicines, being prepared or compounded, we find by often Experience that in some cases, they contribute notable help. For these destroy the exotick ferments of the bowels, and restore the native ferments; they open their obstructions, they fix the blood, and restrain its consistence from too much dissolution; wherefore Chalybeat remedies, after the same manner as certain other alteratives, do perhaps something profit against the procatartick, and more remote causes of a Tympany; but as to the conjunct cause, they contribute little or no succour.

Forms of Chalybeates. Take of our Steel finely prepared two drams, the distilled water above prescribed two pound, Syrup of the five Roots two ounces, mix it in a glass; let it clarify by setting, the dose three or four ounces, in the morning, and at five afternoon.

Take of the Powder of Aron-roots, Crabs-eyes, of each three drams, Crystal Mineral two drams, Vitriol of Mars a dram and a half, Sugar of Rosemary-flowers two drams, mix them, the dose half a dram twice in a day with a convenient vehicle.

A liquor of the flowers of Tapus Barbatu. *Hartman* doth wonderfully magnifie the liquor of the flowers of *Tapus Barbatu* or Mullein, as a specifick remedy in this disease, by putting the fresh flowers into a Vessel

Vessel, being strongly press'd, and put into an Oven with bread being close stopt, afterwards the Liquor being strained, let it be distill'd in *Balneo*, the dose one Scruple in the Decoction of Fennel-seeds and Roots. Surely this Medicine, if it doth effect any thing, ought to be given in a larger dose. P H A R.
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Johannes Angelus commends an Electuary of *Rosata Novella* with *Diatrion Santalon*, and Eggs of *Ants*, which remedy seems to promise something probable enough. In imitation of this I here propound this ensuing.

Take Conserve of Chichory flowers, of Indian Cresses, of each three drams, powder of Aron-roots, *Lignum Aloes*, yellow Sanders, of each one dram, Crabs-eyes one dram and a half, Salt of Wormwood one ounce, Ants-Eggs one ounce, the liquor of *Tapsus Barbatus* half a dram, with a sufficient quantity of Syrup of Citron-rinds make an Electuary, the dose two drams twice in a day, drinking after it of the former distilled water, or of the following Julep three ounces. An Electuary.

Take the water of the leaves of Aron, of the Juice of Elder-berries, of the water of Juniper and Elder-flowers, of each six ounces, the magistral water of Snails, and of Earth-worms, of each two ounces, Syrup of the Juice of Elder-berries two ounces, mix and make a Julep. A Julep.

III. The third Indication: Vital prescribes Remedies against fainting of Spirits, and difficult breathing, and against Watching and Thirst. We will briefly annex certain forms of either kind. Third Indication.

1. Cardiacks.

Take of the water of Napha, Marygolds, Camomile, of each three ounces, of Dr. Stephen's water two ounces, Tincture of Saffron two drams, Sugar one ounce, Pearls one dram, make a Julep, the dose four or five spoonfuls three times aday or oftner in faintings. Cardials.

Take Conserve of Marygolds two ounces, Confection of Alchermes, and de Hyacintho, of each two drams, prepared Pearl one ounce, Syrup of the juice of Citrons, enough to make a Confection, take the quantity of a Nutmeg evening and morning, drinking after it a draught of the Julep.

2. Hypnoticks.

Take of Aqua Hysterica six drams, Syrup de Meconio half an ounce, mix them, and take late at night. Or, Hypnoticks.

Take of small Cinnamon-water one ounce, Diacodium three ounces, Tincture of Saffron two drams. Mix them, and take one spoonful at night, if sleep be wanting. Or,

Take Syrup of Cowslip-flowers three spoonfuls, compound Pæony-water one spoonful, Laudanum tartarized one dram, take one spoonful, if Watchings require it.

3. Extinguishers of Thirst, in this Disease being very thirsty, ought frequently and in small quantities to be administred, that that troublesome symptom may be restrained without much drink, which is perpetually pernicious. For which purpose, Things mitigating Thirst.

Take of Conserve of Wood-sorrel passed through a Sieve three ounces, Pulp of Tamarinds two ounces, Sal prunella one dram, with a sufficient quantity of Syrup of the juice of Wood-sorrel, make a Lohoch, of which let him lick often.

PHAR.

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SECT. II. CHAP. V.

Of an Anasarca.

*The description
of an Anasarca.*

NOW two kinds of Dropsies, viz. Ascites and Tympanie (according to common reckoning) being finish'd, although the third, to wit an *Anasarca* (for that it is an affection rather of the whole body, than of the nether Belly) appertains not properly to this place, notwithstanding the Pathologie thereof having some affiance with the former, we think fit to deliver here also its Cure in short. An *Anasarca* is described after this manner, *That it is a white soft Tumour of the whole outward Body, or of some of its parts, yielding to the touch, and leaving a dent upon compression, proceeding from a watery humour extravasated, and accumulated as well within the inter-spaces of the Muscles, as within the pores of the flesh and skin, yea of the Glandules and Membranes.*

*How it differs
from an Ascites.*

It differs from an Ascites as to its outward form and appearance, yet not as to its morbid matter, which being the same in both distempers, as it is heaped within the greater or lesser hollownesses, it gains divers Appellations of the Disease.

*The Original
from the blood.*

The watery humour procuring an *Anasarca*, doth proceed altogether or for the most part from the blood; for it being continually produced within the mass of blood by the fault and defect of sanguification, it is poured out in greater abundance from the extremities of the Arteries, than can be received, or brought back by the Veins, or the Lymphaducts, or can be discharged by the Reins or pores of the skin, and other vents of the serous Juice.

*The material
and efficient
cause.*

From these it follows, that the material cause of this Disease is a watery humour, and the efficient is blood, which engenders waters and deposits them in the places affected. We will exactly weigh the reasons of either of them, and the manner of becoming and effecting it, and first we will treat of the efficient Cause of an *Anasarca*.

*The blood its
efficient cause in
a double respect.*

1. The affection of the Blood, or rather the Hydropical brood, consists in these two things, to wit, First by reason of a failure or fault of sanguification, it doth not rightly assimilate the nutritious Juice perpetually infused into its mass, but suffers it to degenerate into a watery humour: Then secondly by reason of the too loose mixture thereof, it doth not retain that humour, so degenerated, so long within its consistence, until it might be discharg'd through fit Emunctories or Emissaries, but lets it out every where near to the ends of the Arteries, into the inter-spaces of the Vessels, and there leaves it. Either of these vices of the Blood we will consider a little more.

*First that it
doth not rightly
sanguifie.*

In the first place as to the former, for the most part it is confessed by all, that the Blood it self and not the Heart or Liver sanguifies, by what of late is plainly understood concerning the functions of these parts; yet by what means the Blood assimilates Chyle infused to it self, and converts it into fresh blood, to be bestowed to so many and diverse sorts of uses, doth not easily lie manifest to us. But what some affirm, that it is made only by the exact comminution and commixtion of particles, and for that cause the particles of either kind being confused together, they think, that within the straiter passages of the Liver and Lungs they are kneaded and wrought together as it were with little pestils, seems little probable to me; but on the contrary, I think these bowels (as I have shewed already) are constituted the Organs rather of separation than of mixture; but the reason of sanguification altogether consists in this, that the active particles of the old blood, to wit, the saline and sulphureous, being placed in vigour with the spirituous, immediately act upon the like particles of the infused Chyle as yet existing in an inferiour state, and do so stir them up and ferment them that thereupon being extricated from the coverings of the thicker parts, they are carryed into a like degree of exaltation or perfection with the former; and being at length associated with them, and made also homogeneous, they put on the same nature of Blood; the more thick and heterogeneous particles being removed thence to another place, from those which they had deserted and gone away from. For truly Sanguification is altogether finish'd by Fermentation, even as the maturation of the Must into Wine or Ale; but the reason of the difference is, that Wine being shut up in the Tub, still remaining entirely in the same Mass, is slowly fermented, as to its whole

*The reason
whereof enquired
into.*

whole consistence, and is not accomplished but in a long space of time; but the Blood PHAR.
constituted in a perpetual flux by the loss of some parts and the reparation of others, Part. II.
is fermented by the parts still received fresh, and is generated anew.

The old Blood for the most part affords the same thing towards the fresh Chyle, as The reason and manner of sanguification explained.
Ferment from the flower or fæces of old Ale, being put into new Ale; notwithstanding as it were by a contrary manner; because the huge mass of blood being formerly fermented, doth suddenly ferment and alter the small portions of the Chyle continually brought in; but the fermenting liquor in Ale in a very little quantity is put to the great mass of the other liquor to be fermented; which it brings not to maturity under a long space of time. After the rudiments of blood are so cast by fermentation, the conclusion and perfect assimilation, into blood, is acquired by accension; (for surely that it is so enkindled (as I think) I have formerly shewed by demonstration which arguments chiefly taken from its proper passion, although many have cavill'd at, none have been yet able to overthrow.) Wherefore, while the whole mass of blood consists of Blood and Chyle confusedly mixt together, it is fermented while it is circulating; and being divided into most minute portions, is spread through the whole Lungs, that it might be kindled successively according to all its parts, by the nitrous air suckt in: for by that means both the vital flame is continued, and all the particles of Blood having as it were passed the fire, become more purified, and more agreeable among themselves; moreover, they are so disposed of whilst they are kindling, that while some go into Nourishment of the Spirits, of the Nervous Juice and the solid parts, and others less useful depart into the ferments or recrements of the bowels; mean while others being more fixt, abide longer in the mass of blood, and sustain its consistence, and by fermenting the Nutritious Juice, still engender new Blood, until themselves being impoverished, are at length discarded, and give place to others that are fresh and lustie.

Having shewed after this manner by what course Sanguification ought to be finished, as well by fermentation as accension of the Blood; it will be easie to conceive wherein the fault consists producing an Hydropick disposition: To wit, this usually assumes its rise whensoever either or both those Conditions requisite to Sanguification either fail, or are prevented. An Hydropick temper of the blood springs from a double respect.

First therefore this happens more frequently and rather, for that the blood being depraved in its temperature, doth not rightly ferment the Nutritious Juice poured into it, that so it might be changed into laudable blood. For when the watery particles predominate with the earthy in the mass of Blood, the Salt and Sulphur being depressed with the Spirit, as all the functions, both Vital and Animal, from thence languish and waver, so especially Sanguification it self fails and is perverted. For the Juice of the Chyle commixt with the Blood, when it cannot be dissolved and fermented, with the particles thereof, (after the fashion of other liquors, as often as being mixt they want ferment,) it degenerates perhaps into a watery, acid, or ropy, or otherwise faulty humour, which being afterwards daily encreased, and at length rising to its fulness, lyes heavy on the blood, and oft-times almost stifles its heat; from whence there is a necessity that it be forthwith discharged by some means, and wheresoever it can get vent; but afterwards for that the offices of separation fail in their functions (the stock of the animal Spirits languishing by reason of the diminished provision from the influx of Blood,) the abounding Serum is deposited every where into the pores, and next vacuities whether greater or lesser, out of the little mouths of the Arteries; from whose daily and great encrease, after all the pores are filled, arises that as it were fenny habit call'd *Anasarca* of the whole body outwardly, or of some of its Members. Viz. First from the defect or fault of its Fermentation;

Secondly, not only the defect or fault of Fermentation, but also of the accension of the Blood, induces sometimes an Hydropical disposition on the mass thereof: which is clearly discern'd, inasmuch as some persons inhabiting Maritime or Moorish places, fall into the Dropsie without any other cause or occasion, than that they draw a thicker air endowed with heterogeneous vapours, by which the Nitre is either driven away or obscured. Therefore the blood becoming degenerate, and vitiated as to its temperature; because it is not duely kindled, nor perfected by efflagration within the Precordia, doth not rightly dissolve and assimilate the Juice of the Chyle, but suffers it to be perverted into a watery liquor. But although in the first place, the blood being depraved for this reason, sometimes loses its fermenting vertue, and therefore the rather and more immediately procures a Dropsie; notwithstanding it is manifest, the first fault thereof assumes its origine from unwholsom air suckt in, and not duely enkindling the Blood; because such Hydropicks removing their residence into Sunny and Mountainous places, recover their health without any other Medicines. Secondly, from defect of Accension.

Hitherto

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Reduced to three heads.

First, because the active particles of the blood, are too much consumed.

Secondly, because they are not enough repaired.

Thirdly, because they are buried in duller particles.

Whereof there are three causes.

First from Non-naturals immoderately ingested.

Secondly, From Naturals unduely retained.

Hitherto of the nearest Causes of an Anasarca and which are conjoined to the Disease it self, which namely are the depravation or defect of the mass of blood, chiefly as to its fermentation, and in some measure as to the enkindling thereof; which latter is scarce wont to be effective but when it follows the former: but what remains as to the more remote and procuring causes of this Disease, to wit, from which the defermentative affection arises (that I may say no more of the defect or depravation of its enkindling;) I say that these appear so diverse and many, that I judge it hardly possible to recite them all particularly; notwithstanding, very many or at least the chief may be reduced to these three heads: to wit, For that the watery distemperament of the blood doth arise, inasmuch as its active Principles, viz. Spirit, Salt and Sulphur, are not invested with their fermenting and sanguifying force or virtue, I account this to come to pass, either First because those particles are too much wasted by their great Expences; or Secondly because they are not repaired by convenient and proportionate Refections; or Thirdly, for that they are overwhelmed or obscured by some other duller or heterogeneous Particles being too much accumulated in the mass of Blood: We will a little weigh the Reasons and ways of each of these their coming to pass.

In the first place, the former of these is evidently discerned in frequent and inordinate Hemorrhages, whereby many men, although strong and formerly healthy, are immediately enclined to a Dropsie, more than from any other accident or occasion; the reason whereof is, that the blood is so impoverished, through its more noble Particles issuing out in great abundance, that afterwards it can neither duly ferment nor enkindle the Juice of the Chyle brought into it. Moreover, sometimes the same effect succeeds (although in a more slow degree) from Feavers and other long maladies and languishings; to wit, inasmuch as the blood suffering under a long depression, is so extenuated and robb'd, that at length it becomes watery and defermentative.

Secondly, the Blood sometimes deserting its genuine disposition, declines into an Hydropical one, for the nourishment being more slender than it was wont, or ought to be bestowed upon it, its active and sanguifying Particles are not enough repaired within its mass; for so we have observed, that some who have used themselves to Wine and stronger Drink, after they have been reduced to homely Diet, and smaller drink, of water or small beer, suddenly have become Hydropick. It is a common observation, and frequently true, although of ill omen, that Drunkards, and daily drinkers, if that wild Custom be left, at length becoming sober and abstemious, are much in hazard, left by reason of the usual fermentation of the blood being depressed, they become obnoxious unto that Disease. I knew a notable Drunkard, who declared that a Priest very learned and Pious was guilty of his death, because he gave him admonition to Temperance, and to leave his Drunkenness, and he complying therewith, incontinently fell into a mortal Dropsie.

But the third cause or occasion disposing to that Disease, the most common and notable, consists in this, that the active Particles of the Blood, being involved with other more dull or heterogeneous ones, or being dissipated from one to the other, lose their fermentative power, or cannot enough exercise it. But such an affection of them, as it is wont to be raised from various causes and accidents, so chiefly from these three, one while solitary, another while united together; to wit, First from the Non-naturals immoderately received: Secondly from the Naturals unduely retain'd; or Thirdly, from the Preternaturals corruptly generated in the body.

The errors of Diet deservedly may be referred to the first rank of these (whereby the stock of that Disease is alwayes most abundant.) For it is a common Prognostick and in every bodies mouth, that Gluttons and great Drunkards dye at length of a Dropsie: to which moreover, not only Surfeits and immoderate and daily Tiplings incline, but also frequent and unseasonable Treats; and moreover the continual pouring in of absurd and hard to be digested Nourishment. For from the evil course of Diet of each kind used any while, whenas the Juice of the Chyle, oftentimes crude, incongruous, and above measure plentiful, is poured into the mass of blood; it of necessity follows, that it is first burdened, and afterwards its Consistence being loosened, the more noble Particles being forced asunder, it is so involved, or abated by the other heterogeneous ones, that being hindered, it desists from its fermentative or sanguifying virtue; insomuch that the bowels being in a short time hurt by its assaults, a Cachexia, and then a Dropsie follows, whereof that is always a forerunner.

Secondly, in this place are put all ordinary, accustomed and solemn Evacuations suppressed. It is observable enough, that a Cachexia, and often a Dropsie, doth arise from a menstruous or Hemorrhoidal flux diminished or stoppt, no less than from

from a too immoderate one, (by reason of the fermentation of blood impeded by the heterogeneity of Particles.) Moreover, the same is often wont to be affected from Issues suddenly stop't, or eruptions of the Skin suddenly repercuss'd. Lastly, suppression of Urine, and sweating much hindred, do render the blood more watery, by an immediate and necessary affection, and encline to the Dropsie. Also it is an observation frequent enough of healthful Persons, who being compelled for some time to abstain from going to Bed, that their feet have swoln.

Thirdly, Preternatural things generated within the Body, but especially Tumours and Humours do hinder the motion of the blood, or pervert its temper, and so induce an Hydropical disposition. Tumours stirred up in some place about the Bowels, inasmuch as they hinder or straiten the circuit of the Blood, do cause its Serum to be there extravasated, and poured out; by the accumulation whereof within some cavity, in the first place an Ascites (as we have shewn above) and at length an Anasarca, a consequent of that doth frequently ensue. Moreover, Humours of divers sorts being engendred in divers places within, and transferred into the blood, do first pollute the mass thereof, and defile it with heterogeneous Particles, whereby at length it is so depraved in its temperament, that it perverts the Juice of the Chyle brought in (when it cannot further ferment and assimilate it) into an hydropical liquor. For this reason, nothing is more usual than that Consumptive persons, and those that are affected with strumous and cancerous Ulcers, nay of any sort within the Reins, Mesentery, Guts, or other Bowels of the lower Belly, after they have been long consuming, dye at length hydropical.

Hitherto concerning the next efficient cause of this Disease, also of the chief remote ones, as well procuring, as evident. But as to what appertains to the material cause, it is obvious unto the Sence, that it is a meer Lympha accumulated within the pores of the Skin, and of the other outward parts; which being deposited there by the blood (the liquor thereof being partly serous, and partly chylous Juice) but failing in Sanguification and Nourishment of the body, to which it was destinated, it is cast off like recrements into the vacuous spaces of every vessel. And though the matter of the Dropsie proceed from the Blood and Chyle, yet it is no wonder if it appear neither like blood, nor milkie, but only limpid; because the Urine even of healthful people, after more plentiful drinking, is rendred crude as well as watery; and therefore it is manifest, it is nothing changed by the blood, but leaves in that place, whatsoever of colour or thicker consistence it brings to its mass. And although a reason may be given in either case, that the Urine, inasmuch as it is streined through the Kidneys, and the hydropic matter thorough the pores of the solid parts, even so become limpid and watery; notwithstanding it is evident by observation, that the watery part of Chyle, even while it is confounded with the blood, is not intimately mixt with it, but being deprived of its colour and consistency, it remains under the form of Lympha, within the pores of the blood; the sure sign of which is, that the blood taken from any Animal by Phlebotomy, after being cold it is divided into parts, exhibits a watery liquor (which consists of Serum and Nutritious Juice) plainly limpid, and separate from the other blood. It will be from our present purpose to enquire any further into the reasons hereof, and manner of being so, and wherefore blood, which being poured into water doth presently tinge the same, and bloodies all solid bodies whensoever it is sprinkled thereon, yet dyes the Serum of no colour with which it is intimately confounded and a long time circulated.

From the Aetiology of this disease now delivered, the differences of it may easily be collected; to wit, first it is either universal, when the whole habit of the body and all the members swell up: or it is particular, wherein for the most part the inferior members only suffer, in the mean time the rest of the body pining away for want of Nourishment, which kind of distemper, and not a Tympanie, Prosper Martianns will have Hippocrates style the dry Dropsie, in which what is reported of the Syren, the dry is joyned to the watery.

Secondly, an Anasarca whether universal or particular, is either simple or complicated with an Ascites; and then either an Anasarca ensues an Ascites, or this disease follows that. Moreover an Anasarca may be distinguished many ways in respect as well of the procatactick as evident causes, as we have before intimated; and such differences thereof are found to be frequently of great moment about duely instituting the Prognostick and Cure.

Wherefore, what relates to the prognostick part, this disease while it is simple, proves least dangerous among all the kinds of Dropsies; and a particular one seising only the inferior members, so that the belly doth not together swell with them, is much safer than an universal one.

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Thirdly, From
Preternatural's
generated in the
Body.

Different man-
ners hereof are
reckoned.

The material
cause of an Ana-
sarca is partly
the Serum of the
Blood, and partly
the nutritious
Juice.

Why the hydro-
pick humour is
limpid and not
milkie nor
bloody.

The differences
of the Disease.

The Proгна-
sticks of it.

And

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An Anasarca bringing on an Ascites, wherein for the most part the Urine is plentiful enough, and the thirst not very intense, is far more safe than an Anasarca brought in by an Ascites, wherein the diseased do very much thirst, and make little, red, and thick, and for the most part a lixivial Urine. In like manner it is, or worse, when an Anasarca comes upon a Tympanie or a Phthisis (as sometimes 'tis wont.) Lastly, no slight Prognostick of this disease is taken from the compliance, or the obstinateness of the Patient, about Diet and Medicine. For whatsoever the condition of the disease may be, if the hydropick person refusing medicine will indulge his fancy, we may not hope any good from thence.

*The Cure of it.
Two Indications.*

About the Curatory part to be designed in order, two chief Scopes of Healing do occur, viz. First, that the water between the skin be consumed by some means; Secondly, then provision must be made, lest it be continually generated and accumulated afresh; for which purpose a Physician is to employ his labour, both that the bowels of Concoction being empty'd of their Superfluities, and free from obstructions, may always procure laudable Chyle, and supply the mass of blood in due plenty; as also that the blood (the principles thereof being restored to its fermentative power) may orderly ferment the Juice of the Chyle continually poured into it and assimilate it into Blood. The vital indication seems not at all necessary in this disease as in many others, for that very rarely in this appear swoonings of the Spirits or Watchings, for which Cordials and Hypnoticks are required; and there is little need of restoring Diets, because Fasting and Abstinence rather help, and oftentimes make up the greatest part of the Cure: the reason whereof is, that the Vessels being empty'd through want, do swallow up the waters between the skin, or stagnating in other places, and do discharge them forth partly by the Kidneys, by the pores of the Skin and other Emunctories, and partly do advantageously employ them being yet turgid with alimentary Juice, to the nourishing of the body.

*The first intends
the evacuation
of the morbid
matter.*

First, That the first, *Indication* being Curatory, intending an Evacuation of the morbid matter, may be performed, there ought to be exhibited all Hydragogue medicines, as well simple as compound; and also the forms of medicines recounted and prescribed in the former Chapter of an Ascites. Moreover, hereto belong not only Catharticks and Diureticks, but also Diaphoreticks, which though in other sorts of Dropsies they are very much forbidden, often take place in curing of an Anasarca.

By Purgers.

In a simple Anasarca we may lawfully administer strong Purgers, and frequently they much profit. And truly this disease being cured sometimes by means of a Cathartick, Empiricks do much glory of their Cures, and certain of their medicines become much cry'd up for curing hydropical persons; for if at any time it happens that they have healed one or two labouring with an Anasarca, by their specifick Hydragogues and Elateriums, it is enough wherewith they may always magnifie themselves and their Art, although by the same medicine they have murdered a hundred Ascitical persons. Wherefore, although, Preparations of Spurge, or *Elaterium*, *Pilula Lunares*, *Hercules Bovii*, and other Hydragogues, have sometimes profited in some cases; notwithstanding if they be indifferently exhibited to all Hydropicks, or at all to any endowed with a weak Constitution, and Bowels of a brittle tone, or of evil conformation, they oftener cause death than remedy: wherefore let it always be committed to the judgment of a prudent Physician, the time when, how long, and what sort of Catharticks are to be used.

*Strong Purgers
are convenient,
but not to all.*

We have before described forms of Hydragogue Purgers of every sort, to wit those that exercise their power upwards and downwards, and as well mild as stronger workers, so that they may be referred hither, and accommodated to the method of healing now propos'd.

*The manner of
their working.*

But if the reason be enquired, after what manner Purgers do operate in this disease, and why they more happily, and much more efficaciously bring out waters than in any other sorts of Dropsie; I say, in an Anasarca the morbid matter (which is the Lympha) subsists partly in the mass of blood, partly in the habit of the body, within the pores and vacuities between the ends of the vessels; wherefore, a strong Cathartick being administred, presently troubles and dissolves the mass of blood, and stirs it up to the excretion of any superfluous or heterogeneous thing; and irritates also the little mouths of the Arteries gaping towards the Cavities of the Intestines, that the humour ejected from the blood may easier find vent through these Emunctories. From hence in the first place, the waters fluctuating within the blood are abundantly drained out, afterwards the vessels being empty'd, do presently swallow up again the waters between the skin, and presently discharge them forth partly by siege, and partly by Urine, or Sweat; in the mean time there is no fear left, as in an Ascites, the morbid matter being driven and poured from the blood

blood, by the Medicine, should be further forced into the places affected, whence not easily flowing back again, it should be more largely increased; nor lest, as in a Tympany, by reason of the Fibres of the Stomach and Guts being too much irritated by the Physick, those bowels might be provoked into convulsive swellings. For as long as the bowels are firm and well constituted, the particles of the Medicine inflict them with no hurt; but presently being brought into the blood, they do not only allure waters out of it, but by exagitating the mass thereof, they raise the active particles formerly overwhelmed, and dispose them towards their fermentative power.

Secondly, Hydragogues working by Urine, as well simple as the compound, as also forms of Medicines prepared from either of them, and the manner of their administration, we have also described above, which also may be transferr'd hither to save repetition. But because not all Remedies of this kind do help alike in all the Distempers, it is here observable, that for curing an Anasarca *Lixivials* (as has been frequently manifest by our observation) do far excel other Diureticks. For indeed now it is a common and thredbare Remedy, for any one having swell'd members, after a previous Purge, to take twice or thrice in the day, from six to eight ounces of a Lye made of the Ashes of Wormwood or Broom, made in White-wine, and to continue the use of it for some dayes. This Medicine moves potently the Urine, as I have observed in many, yea sometimes in such abundance, that pissing the quantity of half a gallon in a day and a night, the Patients have recovered their healths in a short time even to a miracle.

We have unfolded in a former Treatise, by what manner and fashion Diureticks of several kinds do operate, and after what manner they affect the bowels, blood and other humours: But that in those that labour under an Anasarca, Medicines endow'd with a fixt and lixivial Salt, expel Urine more than those of an acid, alcali, or volatile Salt; the reason as I judge is this, *viz.* in those affected with this disease, after the fermentation and sanguifying vertue of the blood failing, the watery and crude humours heaped up as well in its mass as in the habit of the body, do there remain almost immoveable for a long time, till at last they (as the manner is of watery Juices long stagnating) do wax soure; wherefore the lixivial particles of the Medicine spread abroad in the blood presently boyl up with the acids of the waters, which while they ferment and move, they stir up in the whole mass of Blood, a notable and excretive fermentation; insomuch that all the particles being put into motion, not only the watery and superfluous being thrust from the rest, are discharged by the Reins; but also the innate and active particles of the blood it self, unfold themselves from the more gross with which they were involved, and lastly rising up, they begin to resume their fermenting power, and to sanguifie.

Take of the Ashes of Broom or Wormwood, or of the twigs of a Vine laccined to whiteness and sifted, four ounces, put them into a glass bottle with a quart of White-wine, let them digest close stoppt. and warm for three or four hours, after strain it; the dose from six to eight ounces twice aday.

Take of white Tartar calcined with Nitre, and after melted in a Crucible to blueness three ounces, small Spirit of Wine a pound and a half, water of Snails and Earth-worms, of each four ounces, digest them in a Sand furnace for two dayes: the dose of the clear liquor from two to three ounces, with four ounces of the decoction of Kneeholm and Burdock-roots in Ale.

For ordinary Drink:

Take of the white Ashes of Broom cleansed two pound, put them into a little Bag, with three ounces of Sassafras, one ounce of lesser Galangal, an ounce and a half of Juniper-berries, and as much of Carrot-seeds, make a bag for four gallons of Ale, after seven or eight dayes begin to draw it.

3. Diaphoreticks do often very notably help in a Leucophlegmatia (which is the commencing or declination of an Anasarca) but in this disease confirmed, they are wont to be more convenient than in other kinds of Dropsies. And although from the beginning they cannot cause Sweats, by reason of the habit of body surrounded as it were with a more thick marsh, however while they exagitate the blood, they cause the innate active particles thereof, being before dormant, and half overwhelmed, to be raised up and disposed towards fermentation, and also they cause all the excrementitious, and chiefly the watery, to be raised into motion, so that presently flowing out of their Receptacles, they may the more readily and easily find way by sige or Urine, and oftentimes in some part by transpiration. But truly after the

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Secondly, By
Diureticks.

And chiefly
Lixivials.

The reason and
manner of their
operation en-
quired into.

Forms of lixi-
vial Diureticks

Diaphoreticks.]

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waters being poured out by purgation, the morbid matter is diminished so much, that the bulk of the body and the swelling of the members begin to abate, the reliques of the humour are best consumed by a moderate transpiration and constant sweating.

*Diaphoreticks
profit which
are taken in a
larger dose.*

We have described before the number and forms of Hydroticks; as to the present purpose for curing an Anasarca, those chiefly are fit which are given in a larger dose; for they whose quantity is very small, their active particles being overwhelmed in the waters, are lost before being infused into the blood they can exert their strength. Wherefore, Spirits, whether armoniac or vinous, as also Tinctures and Elixirs, yea and powders, are more rarely used in this disease, because they effect little in a lesser dose, and if they be exhibited in a very large one, they often hurt the bowels by their outrage; But those things are rather chosen, which being taken hot, and in a full draught, are able to pass into the whole blood not weakned; of which sort, in the first place are Decoctions of Woods, and Roots, whose particles being agreeable enough to the Blood, and not to be tamed thereby, do pass through the whole mass thereof, and do exert their Elastic power by moving together all the humours.

Forms thereof.

Take of the Shavings of Lignum Vita six ounces, Sassafras two ounces, of each of the Sanders six drams, shavings of Ivory, Harts-horn, of each three drams, let them be infused and boyled in eight pound of Spring-water to half; adding of Calamus Aromaticus, lesser Galangal, Burdock and Butter-Bur-roots, of each one ounce, the leaves of Sage, German-der, dried, of each two handfuls, let the strained liquor be kept for use; the dose from eight to ten ounces twice in a day warm; to every dose may be added 20 or 25 drops of Spirit of Sal Armoniac drawn with Amber, or of Spirit of Soot, or half a dram, or a dram, of Tincture of Salt of Tartar.

*External Hy-
dragogues.*

Hitherto of inward Hydragogue Medicines, which cause the Lympha to be drawn forth, either by alluring it inwards towards the guts, or by driving it forth to the Reins or pores of the Skin. Besides, there are certain outward administrations in use, by which the water accumulated within the habit of the body are moved together, and so are either generally disposed to go forth by sweating, or Urine, or particularly are sent out forthwith, a vent being made in some private places.

*The chief Kinds
of them, and the
manner of their
Administration.*

In the first rank are placed Frictions, Liniments, Fomentations and Baths as well dry as moist: Then those particular things that bring out waters are, Vescatories, and things that bring the Skin to an Eschar, and prickings by a Needle. We will treat briefly on each of these, or at least of the principal of them, as far as they have reference to this disease.

1. Frictions.

1. Frictions do frequently afford advantageous success in a Leucophlegmatia and an Anasarca: for when the habit of the body is not only filled with a watery illuvies gathered there together, so that nothing can evaporate, but that the extern parts grow cold by reason of the approach of blood towards them being stopt, often and strong frictions do move together the stagnating waters, and dissipate them from thence in some measure, and also recal again the blood by opening the passages into those parts from whence it was banished; wherefore, not only the swollen members, but also the whole body once or twice in a day, is expedient to be rubbed with a course Cloth, or with a little Brush now ordinarily prepared for that purpose.

2. Liniments,
and,
3. Fomentati-
ons.

2. 3. With or after Frictions, Liniments and Fomentations are sometimes convenient. They are prepared either of Salts, and other Minerals dissolv'd, or from hot and discussing Vegetables, with the faces of Wine boyl'd in water, the hot application whereof opens the pores, moves together more amply the accumulated waters, and discusses them, and also enlarges the compass of the bloody Circuit, the watery heap being somewhat dissipated. Let the Liniments consist of Sulphur, and Salts of a diverse kind, or of Quick-lime, and other Minerals, which being powdered and mixed with the mucilaginous Extracts of sharp Herbs, are reduced into the form of an Unguent; to which let a fit quantity of Oyl of Scorpions be added, for the better consistency. Moreover this Oyl (so it be genuine) applyed by it self, doth frequently afford notable help. I knew a Boy much swell'd with an universal Anasarca, who was cured by this Remedy alone: for his mother (I know not by whose advice) anointed his whole body morning and evening with Oyl of Scorpions, strongly rubbing all the parts with her hot hand; by which act within three days he began to pour forth abundance of Urine, and when he had continued pissing so for some days, the swelling vanishing by little and little, he became sound.

4. Baths.

4. Baths are not convenient in any Dropsie but an Anasarca, and not for this unless in a Diathesis or Declination. For seeing the Blood from the heat thereof, en-

compassing

compassing the whole Body, being made boyling and stirr'd up, every where puts in motion the waters formerly stagnating, and swallowing them up into it self, conveys them variously away; the danger is, lest (as frequently it falls out) receiving them out of the habit of the body into its own mass, it should depose them presently into the Præcordia or the Brain: for there is nothing more usual than an affection of those parts, viz. an Asthma or Apoplexy to come upon Hydropicks by unseasonable bathing. But when the conjunct cause of the disease, (viz. a Swelling) becomes moderate, or not much, a Bath of water impregnated with Salts and Sulphur, or a Hot-house, by which a gentle Sweat is promoted, is frequently administered with success: As for the Stew it is more expedient, and oft-times notably helps, that the Patients be placed in fitting Seats in Salt-houses, near the Furnaces wherein Mineral Waters are boyled into Salt.

5. Vesicatories send out abundantly the waters between the skin, and often too profusely. Touching the manner how they operate we will treat more specially hereafter; in the mean time we advise, that they are very cautiously to be exhibited to Hydropicks, for that Epispasticks of this kind, applyed to the swell'd places, do make the Emissarie too open, by which aperture the water in the first place bursting out, draws oftentimes a great illuvies after it from the neighbouring parts, whence immediately ensues a great prostration of the Spirits. Moreover, sometimes the place is so suddenly emptyed, that being destitute of heat and spirits, it is in a short time sphacelated or mortified; wherefore this Medicine is seldom applyed to the Legs, or the Feet of Hydropical persons, where the heat is weak, and the humour greatest, but sometimes to the Thighs and Arms with security (as often as there shall be need.)

6. Escharoticks are administered a little safer than Vesicatories, to the swell'd places, because from this Emissary the flux of waters happens not so headlong and abundant at first: but commencing moderately grows up by little and little to a great stream, which Nature (after that by degrees it is accustomed thereunto) endures the better. Moreover, there is less fear of a Gangrene from an Escharotick than from a Vesicatory, because in that application the part, whose union is dissolved, is defended by the Eschar against the loss of heat. I have known sometimes an illiterate and rude Empirick, who frequently by an Escharotick did evacuate with success the members of hydropick persons, however swell'd, by the ensuing manner: to wit, he fomented the legs evening and morning with the Decoction of Dwarf-Elder, Wormwood, Cammomile and other hot herbs put into the Lees of Ale or Wine; and between the times of the Fomentations he applyed a Cataplasim prepared of the mass of that Decoction with Bran; after he had used these for three dayes, he covered both legs and feet with a Plaister of Burgundy Pitch, leaving only a small hole on each Calf, about the bigness of a Nut, in which places he put an Escharotick, on the bare skin, of the Ashes of Ashen-bark: which after twelve hours being removed, a small Eschar was left, from whose pores water was wont at first slowly to sweat out, afterwards day by day a little more plentifully to drop out, and afterwards (the Eschar falling off) it used to flow out more abundantly as from an open Spring untill it had drein'd the whole leg both beneath and above.

7. There remains another manner (not inferiour though less used than the former) of draining out the waters between the skin, viz. by the pricking of a Needle; which likewise ought cautiously, and minutely to be used, lest a headlong and too great efflux of waters be provok'd thereby. Take an ordinary Needle (such as Taylors use) and let it be thrust into the skin, pricking over the place chiefly swelled, only so far that blood follow not: and so at one time let six or seven little holes be made, a thumbs breadth distant from each other; from every little hole the water will issue forth by drops, and so it will continually drop out untill all the swelling vanish about the place so pricked; afterwards, the next time after twelve hours, another while after 18 or 24 hours, let the same pricking be exercised in another part of the same thigh, or of the other; and afterwards once or twice aday in this or that member, or in both together, or in more places, let such Emissaries of the water between the skin be excited. For in truth after this manner the hydropick illuvies may be exhausted more plentifully and safely than from any other outward Chirurgery; In the mean time if the new provision thereof be provided against by inward Physick, the disease will be the easier cured. Moreover in a desperate Dropsie life is best prolonged by such an administration, for that the waters being exhausted continually by those outward Emissaries the inner inundation of life is longer protracted. Not long since an old man aged seventy years, overwhelmed with a Dropsie over his whole body, by the help of this Remedy only, remained living for many months beyond expectation, and raised his head above the waters.

PHAR.

Part. II.

The second Indication preferatory what kind of Remedies it suggests. Forms of them.

Hitherto of the Kinds of Forms of Remedies suggested by the first Indication, viz. the Curative; what belongs to the other, to wit, the Preservatory, which respects the temperature and sanguifying power of the Blood to be restored, it offers Medicines of that sort which being endowed with more hot and Elastick particles, revive the active or depressed Principles of the mass of blood, or cause those consumed to be repaired, for which end Remedies commonly called Altering are wont to be prescribed under the form of an Electuary, Powder, Pills, distilled Water, Julep, Apozeme and Diet, to which also Spirits, Tinctures, Elixirs, are sometimes added, for the better efficacy. We will propound one or two Examples of each of these.

1. Electuary.

1. Take of Conserve of Roman Wormwood, Scurvy-grass, the yellow Rindles of Oranges, of each two ounces, Winters-bark two drams, Species Diacurcuma a dram and a half, of Steel prepared with Sulphur three drams, Syrup of Citron-peels what suffices to make an Electuary, the dose two drams morning and evening, drinking after a draught of the Julep, or three or four ounces of the distilled water.

Chalybeates profit much in this Disease.

But only those endowed with Sulphur.

Chalybeate Medicines notably help in this Disease, as in the green sickness of Virgins, inasmuch that frequently the whole or chief scope of curing depends upon this kind of Remedy; yet we are to observe, that not all Medicines of this kind are equally convenient in these cases: for those which are chiefly in use, viz. Salt of Steel, or Vitriol of Mars, and others prepared with acids, and deprived totally of Sulphur, do not help, inasmuch as they do not promote the fermentation of the blood, but rather on the contrary fix it, being too wild or elastick. But for an Anasarca or any watery tumours, in a cachectick habit of the body, Chalybeates of that sort are given, wherein the sulphureous particles are left, and are predominant; as in the first place the Filings of Iron, and the Scales, reduced into a fine Powder, also Steel dissolved with Sulphur, and powdered. The powders of this being taken, are presently dissolved by the acid Salts within our body, whence the sulphureous metallick particles being set free, and brought into the blood, they ferment the whole mass thereof, and revive the like particles in the same, which before lay dormant, and being conjoyned therewith, they give vigour to the blood, and renew its sanguifying power being formerly depressed. Wherefore we may observe by using but a little Chalybeates of this sort, the green and yellow colour of the face is converted into a florid.

2. Powder.

2. Take of the compound Powder of Aron-roots, of Winters bark, of each three drams, lesser Galangals, Cubebs, of each a dram and a half, of Steel prepared with Sulphur half an ounce, Sugar of Rosemary flowers six drams, make a Powder, divide it into twenty parts. One part is the dose, morning and evening, with a draught of the sudoriferous Decoction before prescribed.

3. Pills.

3. Take half an ounce of the gummous Extract residing after the distillation of the Elixir Vita of Quercetane, powder of Earth-worms two drams, lesser Galangal, Winters-bark, of each one dram and a half, Salt of Wormwood two drams, of Rust of Iron two drams and a half, Balsam of Peru one dram, Tincture of Salt of Tartar two drams, Balsamum Capivi what suffices to make a mass to be formed into small Pills, the dose half a dram evening and morning, drinking after it three ounces of the Julep or the distilled water following.

4. Julep.

4. Take of the water of Elder-flowers, of the juice of their Berries fomented, of each one pound, water of Earth-worms magistral, of Rhadish compound, of Aqua Mirabilis, of each two ounces, Syrup of the juice of Elder-berries two ounces, mix them and make a Julep.

5. Distilled water.

5. Take the leaves of Garden Scurvy-grass, of Hedge-Mustard, of Pepper-wort, of each six handfuls, of the Roots of Calamus Aromaticus, Galangal, of Zedoaria, Orris of Florence, of Elder, Aron, of each six ounces, Winters-bark, Jamaica Pepper, of each three ounces, Juniper-berries four ounces, Cloves, Ginger and Nutmegs, of each one ounce, slice and bruise them, and pour upon them eight pound of old Rhenish-Wine; distill it in common Organs, let the whole Lignor be mixt.

6, 7. Decoction.

6, 7. An Anti-hydropick Decoction is described above, among the Diaphoreticks. A Diet-drink is to be taken instead of Ale, and is to be made according to the ensuing form.

Diet-drink.

Take of Shavings of Guaiacum, Sassafras, of each four ounces, Florence Orris-roots, Calamus Aromaticus, Galangal, Enula-campane, of each one ounce and a half, of Juniper and Bay-berries, of each two ounces, Anniseeds, Carue, Sweet-fennel, Coriander and Dill-seeds,

seeds, of each one ounce, long Pepper and Cubebs, of each an ounce and a half, Cloves, Nutmegs and Ginger, of each half an ounce, Jamaica Pepper two ounces, the dried leaves of Sage, Wood-sage, Calamint, Agrimonie, of each one handful, Liquorish four ounces sliced and bruised, boyl it in four gallons of Spring-water to half, the strained liquor being cold, let it be kept in glass Bottles for use; with the constant use of this drink, I have known many labouring with a deplorable Anasarca to be made well. Among many Examples of Dropsies cured, I shall propound but one.

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Part. II.

A certain strong man of a middle age, after he had contracted an Epidemical Quartan Feavour, and being evilly handled from its beginning, had laboured with it above a year, and in the mean while had used an ill course of Diet, fell into an Anasarca, which afterwards in a short space augmented hugely, by reason he indulged himself more freely to drink for quenching his thirst (which was outrageous) so that all his members being swollen from head to foot, and over the very Abdomen it self, he could not turn in his bed from side to side without help.

An Example of
the Cure of an
Anasarca Drop-
sic.

When I first visited this man, and despairing of a Cure (as the Physitian in Celsus lib. 3. Chap. 21. who denied that any intemperate Hydropick could possibly be cured) I immediately affirmed this Prognostick, That he would dye in a short time unless he abstained from drink. Whereunto he replying, profest he would not drink in a weeks space, provided he might be helped; and indeed did as he said, although being very thirsty, for six or seven days he scarce took any liquid thing in his mouth, but what was Medicine; and during that time, when in the mean while he took Hydragogues, Catharticks and Diureticks, and any other things prescribed carefully, he became much better, and afterwards the method (before described) sometime being administered, he was restored to his entire health, and even now though five years since lives and continues sound.

The Prognostick
and Cure of the
Disease.

There remain certain other splanchnical Affections, touching the Remedies whereof, according to the ensuing method, we should here have treated, notwithstanding I have performed this task already for the most part under other titles; for as is above intimated, Remedies which concern the Kidnies we have for the most part unfolded under the rank of Diureticks, and those which concern the Stomach and Guts, under that of Vomits and Purges; what relates to the Spleen we have finished in the Hypochondriac Pathologie; and what to the Womb in the Hysterical. As to what appertains to the Genital parts and their Diseases, and help, I reserve for another time and place; it behoves me now next of all, after treating hitherto of the inward Pharmacie, to discourse something of the outward, and of the Reason or Etiologie of the administrations thereof, which shall be done in the next Section, beginning with Phlebotomie, that great Remedy.

The Conclusion
of this Section.

SECT. III. CHAP. I.

Of Phlebotomie.

Among the universal Documents of Philosophie, or aids of Physick, none either in Theory or Practice hath been more ancient or general than the speculation of the Blood and letting it out by opening a Vein. As to the former we have in other places often explicated the nature and constitutive parts of the Blood, we have unfolded the Virtues and Energy of the same, and have demonstrated that it is in truth enkindled, and that from the burning thereof the flame of animal life, as of a Lamp, doth begin and receives continuation: But as to what relates to Phlebotomie, all Authors of every age have made mention thereof: Moreover the same was ever in Medicinal use with all Nations howsoever barbarous or rude. Neither is it a wonder, for truly Nature it self in the first place hath taught the necessity, and way of that part of Chirurgery; Even the Divine Law commanding the Rite of Circumcision, as a Symbol thereof, seems to intimate that the innate impurities of Humane Nature ought to be purged in some manner by letting out the blood.

Phlebotomie a
very general
and ancient
medicine.

That

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Part. II.

*Nature shews it
by Hemorrhagies.*

*Critical either
with or with-
out a fever.*

That we may methodically discourse of this great Remedy, we ought to consider, by what means, also for what causes, and ends, the letting of blood either happens spontaneously to Nature, or is indicated by the Physitian; then secondly we will annex the chief effects of this Evacuation, as well good as bad, whether advantageous or disadvantageous, and together propound certain Rules and Cautions to be observed, but due administration of Phlebotomie.

As to the former, spontaneous Hemorrhagies (which suggest the use of Phlebotomy) whereas they are manifold and of diverse kinds, they are usually reduced to these two heads or ranks: to wit, they are denominated either critical, Nature endeavouring something good and wholesome; or symptomatical, which for the most part happen, she being dejected from her government, and being altogether out of order. The bloody eruptions of the former kind are again distinguished; that they are either raised without a Fever, and are either periodical, which happen often at set seasons, as the Flowers in Women, and the Hemorrhoids in some, and in others the solemn or otherwise accustomed opening of the Nostrils; which very often succeed according to the great changes of the Year, or alterations of the Air: or they are fleeting and uncertain, as when blood doth advantageously break out of those places, and of many others, one while in this part, another while in that part of the body. Moreover, bloody Crises do sometimes happen in a Fever, and do often put an end to it, as Hippocrates long ago observed, and is now manifest by very common observation. The blood breaks out in all these cases, inasmuch as being turgid, and above measure rarified within the vessels, it desires a larger space, wherefore, unless some portion thereof give way, the whole mass runs the hazard of being constricted, and as well the motion thereof to be hindered, as the enkindling to be suffocated, and the temperature to be perverted.

*The causes
thereof proceed
either,*

*i. From the
kindling of the
blood.*

For there are two chief Reasons or Causes, wherefore such turgescencies of the Blood do arise: inasmuch as its liquor is as well inflammable, as fermentative.

1. As to the former of these, that the Blood may be duely enkindled for the supporting Life, and the due exercise of the functions thereof, it behoves that the innate sulphureous particles of it be proportion'd unto the Nitrous adventitious ones from the Air. Therefore as often as the Blood being very boiling and rarified, is much opened and loosened in its one consistence, so that the Sulphur being dissolved, is kindled in great plenty, there is a most frequent and painful breathing instituted for the drawing in of a more plentiful Nitre. Now if the Sulphur abounding in this manner, cannot be wasted by burning, nor the vital flame regulated, the next course immediately to diminish the sulphureous fuel, is, that a certain portion of the rarified Blood have vent. From hence, not only in Fevers, but after drinking Wine, Bathings, being in the Sun, and other accidents by which the Blood grows very turgent, either an Hemorrhagia, of its own accord succeeds, or there is often need to supply the defect of such a spontaneous evacuation by Phlebotomie. But that such kind of effusions of Blood, whether made by Nature or Chirurgery, are commonly reported to bridle its heat or raging; really they do this only inasmuch as they diminish the kindling of the blood, by withdrawing part of the sulphureous fuel, as Oyl from a Lamp.

*2. From its
Fermentation.*

2. But moreover in the second place, the Blood inasmuch as it is a fermentative liquor, it is apt also to be extravasated. Namely, if at any time any heterogeneous thing, and not miscible, be confounded with its liquor, it grows hot very much, like Wine in a Vessel, and boyls up in the Vessels to exclude that disagreeable thing, which if it can neither subdue, nor turn off by Sweat, Urine, or otherwise, the Blood it self excludes part of it self as a Vehicle for carrying that matter forth, wherefore ever a vent is to be found. For this reason, (viz. that any disagreeable or indomitable thing, may be turn'd out of the mass of blood) divers sorts of Hemorrhagies happen, as well in fevers as without them; all which are excited by Nature for an intention of good, as also those by which the too much enkindling of the Blood is depressed: But that frequently it happens otherwise, ought to be imputed to divers accidents and circumstances. But for the most part the failure about the spontaneous Hemorrhagies critically instituted, is either in the first place because the blood while it is boiling knows no measure of flowing out, and therefore being stirr'd into violence, it flows out too much; or secondly, because the mouths of the vessels once opened do not presently close again, nor are able to be shut; or Thirdly, because Nature endeavouring an excretion of blood, doth it by places more open, but often inconvenient; as when an Hemorrhage happens through the Lungs, the Kidneys, Guts, or other Bowels which therefore pass from a Critical into a Symptomatical and often into a malignant Hemorrhage.

*i. Critical
Hemorrhagies
sometimes turn
into symptomatical.*

Neither

Neither only by these means, but by many other failings of Nature, or impediments, do Symptomatical Hæmorrhages happen, in all which either the Blood it self, or the Vessels containing it, or both of them together, are wont to be chiefly in fault.

1. In the first place, the Blood, besides the reasons above mentioned, (to wit, forasmuch as it becomes inflammable or fermentable above measure) is apt also to be extravasated, because either its liquor being empoisoned, or otherwise corrupted, cannot retain its due mixture, but being apt to coagulate or putrifie, divides it self into parts; and whilst some of them being here and there planted, sending forth spots, wheals, and other brands of Malignity, do discolour the Flesh and the Skin, and obstruct the proper passages; others otherwise running out and breaking forth where-soever there is a vent found, do produce bloody Excretions in divers places, as is commonly discerned in the Plague, Small-pox, Measles, and Malignant Feavers; yea perhaps this in some measure is the reason why in scorbutick Distempers, as spots and marks, so also Hæmorrhages are so familiar.

2. Secondly, The Vessels bringing Blood being faulty many and divers ways, but chiefly in these three, do appear the cause of a symptomatical Hæmorrhage, viz. In the first place, if perhaps any where some of them are obstructed, as often as the blood assumes a more rapid motion, either in the same place, or in the contiguous parts, and also sometimes in remote parts it is constrained to burst out. Frequently from such a cause an Hæmoptoe proceeds; moreover Spitting of blood, and the Hæmorrhage of the Nostrils do often follow the suppression of the Terms and Hemorrhoids. Secondly, the little mouths of the vessels (by reason of the fleshy Fibres being loosned or resolved by which they are clos'd) sometimes are ill formed, so that when the ends of the Arteries do gape too much, the little mouths of the veins do close. By reason of this affection, Scorbutical and Cachectical persons, are found obnoxious to Hæmorrhages, as we have remarkt in another place. But Thirdly, it frequently comes to pass that the Vessels, being so evilly formed, are also convulsively affected, and so the morbid cause being as it were doubled, this evil is much encreased, insomuch that the muscular fibres of the Vessels being inordinately contracted, cause sudden and violent fluxes of the blood, one while towards the upper parts, another while towards the lower; and so their little mouths being open in the mean time, they provoke prodigious Hæmorrhages. For I have observed in some persons, when the current of blood was small enough, with a small and weak pulse, the Convulsions of the Vessels generated in some place, and propagated under the likeness of wind running to and fro in the body, to drive more impetuously the blood, however slow of it self, and to constrain it into violent eruptions; and in cases of this sort, when Phlebotomies and Medicines refrigerating and tempering the blood have not at all profited, the greatest relief hath been found from Narcoticks, Antispasmodicks and Ligatures.

3. Thirdly, If perhaps it shall happen that these faults of the Blood and Vessels are complicated, and put forth their mischiefs jointly at once; from thence it will be of necessity that this evil will be more intense, and more frequent and prodigious Hæmorrhages will be raised: the reasons of which as they appear plain enough by what goes before, it will be neither necessary nor seasonable here longer to dwell upon explicating of them; but rather whereas we have designed hitherto the acts of Nature about spontaneous effusion of Blood and its courses both rightly instituted, and also wrongfully and evilly constrained; now it behoves us next to declare, how far Art (for the most part the Ape of Nature, and sometimes Mistress or Moderatrix thereof,) can act likewise well, or better about letting of blood, and how sometimes it is wont to succeed worse.

We advertise of these things in general, that a Physician imitates Nature in some cases of letting blood, exceeds her in other cases, and frequently regulates and reduces her when acting amiss. Moreover, there are some cases wherein nature excels far the efficacy of Art concerning bloody excretions; briefly of each of these.

Therefore in the first place, in whatever affects, spontaneous Hæmorrhages are wont to bring help, when these are wanting, Physick the Handmaid of Nature rightly substitutes Phlebotomie. Therefore, if perchance the Blood be immoderately kindled by reason of its Sulphur being too much loosned and advanced, by breathing a vein, what is superfluous of that inflammable fuel will flow out, as also the immoderate turgescency of Blood, by reason of somewhat untamable being mixed with it, will be allay'd by this course. Wherefore letting of blood is advantageously administred, as well against continual Feavers, which proceed from the former cause, as intermittent Feavers, whose fits proceed from the latter cause. Also in like manner, as often as an accustomed evacuation being suppressed, or a humour driven back from the

PHAR. Part. II.

2. Symptomatical Hemorrhages arise, either,

First by the fault of the blood.

Secondly, The fault of the Vessels, for that they are ill formed.

Thirdly, Forasmuch as they are convulsively affected.

3. From the blood and vessels being both in fault.

Emission of the Blood procured by art.

1. It either imitates Nature.

P H A R.
Part. II.

2. Or excels
and regulates
it.

the outward parts, or a sudden stoppage of the pores, or if a Surfeit, drinking of Wine, or other accidents of this nature, cause a turgescency of blood (inasmuch as they dash heterogeneous particles against it) Phlebotomie is usually the most ready Remedy.

Secondly, Physick in Blood-letting, not only imitates Nature, but often excels it; and also succours her being weakned, and reduces her often erring. For if at any time the blood struck with violence, rushes in a heap against any part, and either presently breaks out in the same place, or abundantly gathered together engenders an Inflammation, a vein being pierced in a remote place, stops that preternatural tendency of the blood, and frequently carries away the bleeding, or inflammation. Wherefore, in a Pleurisie, a Squinancy, a Peripneumonie, in spitting or vomiting of blood, when Nature is vanquished, or being outrageous, seems to cast violent hands upon her self, Chirurgery recalling the blood to another part, and sending it out, restores the matter that was almost desperate.

Moreover Physick frequently restrains or reduces Nature, when too prodigal or prevaricating in pouring out of the blood: for in truth all immoderate Hæmorrhagies do want Bridles, not Spurs. But in the Plague, Small-pox and Measles broke out, and in Malignant Feavers, sometimes the blood spontaneously flowing out, portends for the most part evil; therefore in those affects styptic Remedies, or things stopping the eruption of Blood, are more convenient than breathing of a Vein.

3. Or Art out-
done by Nature.

Thirdly, Notwithstanding on the contrary there are cases of shedding blood by Nature, which physick can no way imitate, neither if they chance to fail, can be supplied by Phlebotomy. In Feavers about the Crisis of the Disease, to wit, after the digestion of the matter, that is to say, the preparation for Excretion, spontaneous Hæmorrhagies if coming in time, do far excell any Phlebotomie which none knows the best season of; Moreover, the Fluxes of the Terms and Hæmorrhoids happening by Natures instinct, are more advantageous than the mission of blood provok'd by Art in any of those places.

Phlebotomy and
spontaneous He-
morrhagies dif-
fer as to the
subject and
matter.

Between Phlebotomie and spontaneous Hæmorrhagies, there is yet a notable difference, (although not of great moment in Physical practice) viz. both as to the Subject and Matter of either of them; for in this the blood being florid, and thoroughly Scarlet, doth for the most part only flow out of the Arteries, but in the other Evacuation the Blood being of a black purple with a Scarlet Cream, is only drawn out of the vein. Whence the stream of Blood, which is one within all the vessels and throughout continuous, acquires such a diverse kind of appearance, seeing we have shewed in another place, it is not our present purpose to make any further search into this Ætiologie; because it concerns not much to the curing any distemper, out of what vessel the blood be let, provided it flow out largely: But that the ancients do in some cases commend Arteriotomie, and prefer it to an incision of a vein, the Circulation of Blood not being then known, we have elsewhere discoursed how well it may be done.

The use and
effects of Phle-
botomy.

Hitherto of Phlebotomie compared with a spontaneous Hæmorrhage; now our next business is, to describe the use and effects thereof, as well good as bad, in Physical practice. Wherefore we will first shew in general what alteration of the mass of Blood this Evacuation brings; then what diseases it more immediately respects, either of the whole body, or its particular parts.

How it affects
and alters the
Blood.

About the former, it is obvious enough that the blood is altered by breathing a vein, both as to its quantity and temperament, and as to its disposition and motion.

1. Diminishes
its quantity.

The first and most common Indication of Phlebotomie, is, that the plenty of blood be diminished by this Administration. And truly this is a vulgar Remedy, to remove or provide against a Plethora. Any one, though of the vulgar sort, growing to a full habit of body, lets blood without the advice of a Physitian; Moreover Rusticks and Country men for healths sake, once or twice in a year cause blood to be drawn from themselves and their Beasts. But although this custom is grown so much in use with some prodigal of their blood, that they breath a Vein on the smallest occasion, and sometimes without any manifest cause; notwithstanding we may find many others no less obstinate against this custome, insomuch that for no cause will they lose any blood, unless the greatest necessities be urgent.

Emission of the
Blood is not to
be either too
prodigally, or
too slenderly
made.

The reasons of
the former
hinted at.

Upon this matter (whereas Arguments are alleadged on either part,) that I may in few words determine what seems fit to be ordained, in the first place it is requisite we grant, that letting blood is convenient against a Plethora either made, or beginning: for by no other Remedy are the evils of that Affection wont to be better removed or provided against. Notwithstanding, the necessity of this evacuation ought to be declined as much as may be; because from thence (as we have intimated elsewhere) the blood becomes more sulphureous, and less salt, and for that reason it
most

most commonly disposes all men to be feaverish and to be fat. Moreover the Great Remedy Blood-letting, if it be prostituted to every little occasion, becomes less efficacious to any grand affections when need requires: To which we may add, that according to the vulgar observation, by how much the more familiarly any one uses Phlebotomy, he will the more frequently stand in need of it: for blood being emitted to avoid a Plethora, the rest of the mass will the sooner rise to a Plethora: far otherwise than is the opinion of some, who dread lest the store of blood be consumed by frequent Phlebotomy; for that on the contrary by this means the quantity is more increased, although the Crasis be the worse: for so the blood having lost much of its balsamick Salt, and preservative against putrefaction, instead thereof, is filled with a pinguifying and more fiery Sulphur.

Secondly, Phlebotomy doth frequently correct the mixture and temperament of the blood in a manifold respect. For in the first place, if any thing heterogeneous be confounded with its mass, which cannot be rightly digested, nor easily excerned and sent away, a Vein being opened, the blood flowing out conveys frequently much of the portion of that matter forth with it, insomuch that the rest may be either subdued or expell'd. For the orifice of a vessel being opened, presently the blood fermenting gathers together the extraneous particles as much as possible, and excludes that portion of it self wherein many of them are heaped up: From hence we may observe the blood flowing out first and last to be well enough, when that emitted between appears corrupt. Also secondly, the blood declining from its temperament, is frequently restored by Phlebotomy. For when the mass thereof by the Sulphur or fixt Salt, or both together being exalted, shall degenerate into sharp Salt, or saline-sulphureousness, a portion of the blood being withdrawn, immediately a new fermentation thereof arises, and very often there is a transposition made of all the particles of that sort, that afterwards the Spirits may a little emerge with the volatile Salt, and recover their dominion, the Sulphur, and fixt Salt (as is fitting) being subdued. For this reason it is that letting Blood doth not only confer great help in Feavers, but also in the Scurvy, Jaundies, and beginning Consumption; for the blood after the Vessels are emptied, like the Stomach disburden'd, doth better digest and assimilate any humours ingested, and the more easily throws off and separates whatever is heterogeneous.

But if the mixture of Blood begins to be much loosned and become very bad, as in the Plague and malignant Feavers, we must altogether abstain from Phlebotomy; for the blood being withdrawn, the store of Spirits (whose only part it is to vindicate the mass of blood from putrefaction and corruption) is diminished, so that immediately all things tend to a deadly dissolution. Moreover, if the Dyiscrasie of the blood shall be of that manner, that the more noble Principles, to wit, the Spirit, the volatile Salt and Sulphur, being depressed or consumed, the watery and earthy particles predominate, the blood ought not to be sent out, but preserved even as the treasure of life; for when the abundance of Spirits are so small, any loss of them doth cause all the functions to stagger, and gives way to the disease; wherefore in a Dropsie, Cachexia, Consumption, and other Distempers, where the active Principles are greatly depressed, the opening a vein is almost the same thing as cutting a mans throat.

In the before mentioned cases, where the temperament of blood is respected, it is easie to determine, whether Phlebotomy be convenient or not; but in some others, as in a putrid continual feaver, when upon this hinge Life and Death are turned, there is need of the greatest deliberation: and so much the rather because the event of the Disease, and the success of all the accidents in its whole course, whether good or bad, is usually imputed to Blood-letting, or its omission: and from hence it is, that Physicians being solicitous to preserve their own reputation, do chiefly raise doubts in their consultations of this matter. But truly in this difficult knot that we may not be led by the rumour of the vulgar (as it chances to happen) one while approving, another while condemning Phlebotomy, but with more certain advice: we must consider the state of the Blood, the tendency of the morbid matter, and the strength of Nature. First as to the former, if in a putrid Feaver, the blood very much growing hot shall raise a great heat, with thirst, watchings, and burning of the Jaws, and no eruption of abundant sweat, nor pulses appear, or is suddenly expected, opening of a vein is so clearly demonstrated, that it is a wickedness to omit it; but on the contrary, if in a languid body, a slow and a remiss Feaver, but continual, arises, with a weak Pulse, let Blood-letting be spared, and the cleansing thereof be procured by breathing Sweats, Urine, and blistering. Notwithstanding, in a middle state of Blood, and of a Feaver, Phlebotomy almost indifferent in it self, is determined by other things: Therefore secondly we must weigh the tendency or flux of the morbid matter, which

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2. Phlebotomy
amends the
mixture of the
Blood.

It restores its
temper.

Some distempers
of the blood ad-
mit not Phlebo-
tomy.

In some cases
about Phlebotomy
it is very
doubtful.

And chiefly in
a continual pu-
trid Feaver.

How the doubt
is to be deter-
mined.

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if it remain dull in the mass of blood, and unfit to be separated, and so (as it is frequently wont to be) instead of a Crisis, a translation towards the head be made, and threaten the brain and nervous stock, the cutting of a vein ought seasonably to be administered, whereby these evils may be provided against. Notwithstanding, if that this matter being soon raised into a rage, and either rushing inwardly to the bowels of the nether Belly, provokes a huge Vomiting, or Dysenterical affections, or being driven outwardly, seems to be about to bring the Small-pox, Measles, and other pushes, every such force of Nature, if good, ought not to be disturbed, if evil, not to be made worse by Phlebotomy; for in these cases it is not only dangerous to let blood, but also very scandalous. Thirdly, about Phlebotomy to be administered in a doubtful case, we are to take heed to the strength of the Patient; for in a healthful Constitution, a vigorous Age, the commencing of a Disease, and the functions both vital and animal being yet in a florid or indifferent estate, we may confidently prescribe letting of blood, unless something indicates the contrary. Notwithstanding, when it is otherwise, as to those conditions, we may not rashly proceed to that Evacuation.

Thirdly, Phlebotomy corrects or stays the inordinate motions of the Blood.

Thirdly, the inordinate motions of the Blood, when being very much moved, as it were, with fury, it either rushes impetuously one while into these parts, another while into those, or transfers the noxious matter, are best restrained or reduced by Phlebotomy; wherefore in great Cephalalgies, in all soporiferous or convulsive invasions, for Catarrhs, Ophthalmia's, and a Cough, Asthma, fits of the Gout, and Stone, or Phlegmons, Erysipelas's, also for many other Distempers, raised by the flowings of the Blood or Serum, an incision of the vein is commonly prescribed, and indeed for the most part as with good success, so altho upon right Reason; for the Vessels being emptied, the blood having obtained a more free space, is circulated pleasantly and undisturbedly, besides, whatever is extravasated of the Blood or Serum, is wont to be sucked up again and reduced into its course.

What Diseases, and of what parts Blood-letting chiefly respects.

The effects as well good as bad being thus shewn, which happen to the blood in the manifold state thereof, by Phlebotomy, we will next make strict examination what Diseases chiefly, either of the whole body, or of any private Region that kind of Remedy doth more immediately regard. And first as to what relates to general Distempers, it is commonly enough known, that letting blood is indicated by a hot and dry temperament, and interdicted by a moist and cold. It is usually propounded in every Fever, but never in a Dropsie. Moreover, if we consider particular Diseases, there is no region or part of the Body, but as they rejoyce in the influence of vital as well as nutritious blood (as long as it is well) so as often as it is disturbed in any place, or reaches out any disagreeable or provocative thing, in place of benign Juice, it requires avocation and a letting out thereof. If I should take notice of every single case of this Indication, we should here rehearse almost the whole Pathologie of the humane body. An aking Head, a Brain oppress'd with blood, or overflowed with Serum (whence spring a world of evils) burning of the eyes, inflammation of the face, mouth and throat, all the diseases of the Breast and Præcordia, (in as much as the disorder of Blood affords a rise or fuel to each of these) likewise obstructions or inflammatory affections of the Liver, Spleen, and other Bowels; moreover, as a Plethora, and Athletick habit of the whole body, so also the tumours of each member, painful and convulsive passions, seem to accuse the blood as Author of all the evil, and require its sending out, as a certain kind of revenge.

After Phlebotomy being indicated these four things following ought to be considered. First the place from whence Blood is to be taken.

In these and very many other distempers, if at any time Bleeding be clearly indicated, before it be performed four things ought to be considered, viz. In what place, by what manner and instrument, at what season, and in what quantity the blood ought to be taken away.

First, as to the former, although according to the Laws of the Circulation of the Blood, as often as the mass should be diminished, it differs little from what vessel a part thereof be taken, provided it be large enough; notwithstanding, for that besides a general evacuation of the blood, sometimes a particular one properly called Derivation (as when the blood is to be brought out of a private place where it is accumulated) and moreover a Revulsion, when it is to be called into this or that part, are intended; for that reason, in a humane Body there are appointed as it were various Boundaries, out of which, now by this, now by that, or by another vein, the blood may be emitted as occasion is given, and for the uses chiefly requisite.

If therefore at any time an universal Evacuation of the blood be indicated, the median vein of the Arm is best to be opened, for this is easily opened being large enough, and whereas it equally flows from the whole body to the orifice thereof being open enough, by whose more free efflux not only a Plethora is taken away, but the greater vessels being every where employed after this manner, the blood stagnating in any place,

place is brought into motion, and being extravasated is again swallowed up into the veins; wherefore, in great distempers when the blood being heaped in the Brain, or Præcordia, does threaten sudden destruction, the best way not only of general Evacuation, but of a Revulsion, is to send the blood by a full current out of the vein of the Arm, being largely open'd.

But if without any great Plethora the blood ought to be evacuated from the whole, and pulled back from the upper part of the body towards the inferiour, as in the suppression of the menstrual Flux or Hemorrhoids, it will be rather fit to bleed in the Foot or sedentary vessels by Leeches. But if after the blood being evacuated from the whole, it be also to be derived from any private part where it is accumulated, let its drawing off be near the place affected. Hence in Cephalick Diseases, we open the vein of the Forehead, of the Temples, or of the Throat. To cure Tumours, or pains raised in the Joynts, we cut a vessel either beneath or near them, or draw out the blood by Cupping-glasses or Leeches. In like manner in distempers of the Thorax and nether Belly, either Cupping-glasses are applyed to the region suffering, or Leeches to the sedentary vessels.

But that some Vessels are reported to bear a peculiar respect to certain Bowels, and that they ought to be lanced in their distempers; viz. such are the outward brachial vein, which is said to respect the head, and the inward the Liver, also the outer vein of the Hand tending to the Ring-finger, which is said to respect the Spleen, and for that cause this is called the Salvatella, and the former of them the Cephalick, and the other the Jecorary; all this is meerly a vulgar error, which being propt by no reason or Anatomical observation, I am ignorant whence it took its origine; Therefore as soon as it is agreed on to cut a vein and its place, let a large Vessel be chosen, and very conspicuous, that it may the more easily be opened; and being remote from an Arterie, Nerve, and Tendon, may be the more securely lanced; wherefore in the Arm the median vein is commonly chosen, although the Cephalick being less environed with other Vessels, is the more safely opened.

The Jugular Vein is almost always opened as often as blood is let in Beasts, it is a wonder it hath not obtained the same Custom in Man, when the large and eminent Pipe hereof may most easily and safely here be cut, because it neither hath an Arterie for its companion, and lies a great way from any Nerve. Moreover, from this Vessel as from any other whatsoever opened, an universal evacuation of blood is made from the whole body, and together the best derivation thereof from the head, so that all the stagnations or aggections of the blood and Serum are discharged thence.

Concerning Vessels in the foot or the hand there is no great reason of choice, but take the Vein which chiefly swells: it matters little concerning the Place, unless that if incision be made above, or near the Ankle, there is great care to be taken lest a Tendon be hurt, which sometimes by unskilful or rash Chyrurgeons happens to the damage of the Patient. Moreover, let care be taken lest a Vein be cut near its Anastomosis with an Arterie, for if this be committed, the blood being entirely Scarlet, will impetuously skip out, and the flux thereof is not easily stayed, nor the orifice of the vessel soon stoppt.

The chief places being thus designed of letting forth the blood, and the choice of the Vessels being shewed, we ought next to treat of the Manner or Instruments by which blood is drawn out; which is used to be done either by a Lancet, in cutting the Vein, or by suction by Leeches, or by Cupping-glasses after Scarification. But there is no need of discoursing these, because each of these parts of Chyrurgery are every where in familiar use by Quacks, Barbers and Women, and all things relating to them so commonly known, as a man his own house; wherefore we will speak but one word.

Helmont of late, and still certain followers of him, Pseudochymists and Fanaticks, have ejected Bleeding out of all Physick, because they think this evacuation to be a great injury to nature, (which being aided either by her own strength, or by their Panacea's, they will have to overcome every offensive thing of her self;) Surely, this is no less ridiculous a thing than that long since Chrysippus, Apamantes, Strato, and some others, (as Galen reports) damn'd this Remedy, because a Vein is difficultly known from an Arterie. Truly it is manifest enough by sad experience, that in cutting a vein sometimes an Arterie hath been pierced; whence either death or loss of the member sometimes ensues: the reason whereof is, not as is commonly alleadged, that the coats of an Arterie being more nervous or membranous than the coats of a Vein, can scarcely or not at all be healed, when in truth that Vessel is endowed with more and thicker fleshy fibres; but the cause is, that an Arterie like the Heart it self, ought incessantly to shake and beat, the fibres thereof repeating perpetual turns of Systole and Diastole; wherefore, a little hole being made in its

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In some cases from the Arm.

In others from the vein of the Forehead, Temples or Throat.

The Cephalic Vein of the Arm, the Liver Vein, or the Salvatella erroneously so called.

The Jugular Vein is most safely opened.

Of Veins in the hand or feet.

We ought to consider by what means or by what instrument the Blood ought to be drawn forth.

Some of the Ancients as well as Moderns have ridiculously exclaimed against letting of Blood.

Wherefore in opening a Vein the pricking of an Arterie is so dangerous.

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Pipe for the most part remains incurable by reason of the continual motion of the Vessel, and the efflux of blood. It is otherwise in a Vein whose opening is immediately stopt of its own accord; for but little of contractive work lies in its Coats, yea this only, that its fibres being lightly opened as occasion serves, the blood flowing back of its own accord, is gently moved forwards; and after Phlebotomy, the vessel being empty, they are permitted to be quiet, so that in the mean time the little hole made by incision is easily glewed together. Wherever Physician or Patient do dread the opening of a vein to be administred, drawing of blood by Leeches or Cupping-glasses, will aptly enough and with like advantage supply the defect hereof. Moreover these administrations to remove the conjunct cause of a disease, where there is need rather of partial than general Evacuation or Derivation, are frequently prefer'd to Blood-letting it self. There is no need to dwell longer on explicating the manner and reason of the effects of either of these operations, commonly enough known, but proceeding to other things, we will next throughly weigh the Time and Quantity of letting Blood.

Thirdly, The Time of letting Blood comes in to consideration.

The opportunity of letting blood is often of so great moment, that whereas this Evacuation succeeds well at one time, at another it highly prejudices: But there are diverse respects of time to be considered about the due performance of Blood-letting, but chiefly these four: The Time of the Disease, the Age, the Year, and Day: The first concerns chiefly the Cure of the Patient, the others the Preservation of him.

1. In respect of the Disease.

First therefore if blood ought to be let, in any Disease, it will be chiefly seasonable about the beginning or encrease thereof, but not at all or very cautiously in the state or declination. For at that time whilst Nature is busied, endeavouring a Crisis, so that the Spirits are in great labour, and the blood ferments very much, that great endeavour of it ought not to be disturbed; and in the height of the disease, either Nature being Conqueress doth not want such a relief, or being subdued will not endure such an Evacuation.

2. In respect of age.

Secondly, If at any time for preservation it be deliberated touching letting blood, Infants, Boys, and Old men, by the Custom of all Nations obtain an exemption; also this evacuation was wont to be interdicted to pregnant Women, but now most commonly prescribed. Men of a vigorous Constitution and middle Age, do well enough endure Phlebotomy, and oftentimes want it. Notwithstanding the first and second time it ought not to be done without great occasion, for that being once begun and afterwards repeated, it will soon proceed into an inevitable Custom.

3. In respect of the Year and its parts.

Thirdly, Hence they who used to let blood Spring and Autumn, afterwards cannot omit this evacuation without hazard. But to whom it will be either profitable or necessary to breath a Vein once or twice a year, the chief seasonable times will be in the beginning of Spring and Autumn, viz. when the Blood being prone to ferment anew, is in danger to change its Crasis. Phlebotomy seasonably administred, provides lest the Sulphur and Salts being exalted, it should contract a feaverish, scorbutical or other peccant distemper; likewise, lest suffering a flux, it should pour forth the serous Recrements, and other Feculencies upon the Brain, the Lungs or Bowels of the nether belly. About the Solstices, when our bodies are very cold, or hot, the blood, as the juice of all Vegetables, consisting in a more fixt state, and unapt to swell up, ought not to be let out, unless upon some urgent cause.

The Aspect of the Moon and Stars are here of no moment.

But whereas some precisely, or rather ridiculously, observe about Phlebotomy, (even as the Countrey men about Gelding Cattle,) the position of the Heavens, and the Aspects of Moon and Stars, it appears altogether frivolous; and for that chiefly is this Custom condemned, inasmuch as counterfeit Astrologers have a Figure in their Almanacks wherein every sign of the Zodiack, is allotted to every particular member of our bodies; and for that cause, under what sign the Moon is conversant, they forbid blood to be drawn from the respective part of man. They who observe without reason the Heavens, do err (as the saying is) the whole compass of the Heavens. Moreover, this vulgar error is not only absurd, but frequently malevolent, inasmuch as many of the common people will abstain from Phlebotomy whatever indication makes for the same, if (as they say) the Sign be in the place of letting blood.

4. The time of the day about letting of Blood.

Fourthly, As to what relates to the time of the Day, in acute Diseases when a Physician is sent for, and there be indication for Phlebotomy immediately to be performed, after the body is prepared, he may prescribe that operation any hour in day or night; but otherwise, if any interval may be allowed, then breathing a Vein rather is to be celebrated in a morning when the Stomach is fasting, the vessels emptied by sweat in the night, the stream of blood being quietest, and appearing free from any serous filth. Yea although necessity urge, it may be deferr'd a little until the new Juice

Juice of things eaten be pass'd into the blood; for the vessels being emptied will not only snatch the crude Chyle into themselves, but frequently what is disagreeable or unproportionate into the blood, whence not only its motion is disordered, but also the vital flame runs the hazard of being extinct. I have known some by Phlebotomy administred presently after plentiful Drinking, or pouring in of vinous liquors, to have fallen into dreadful swoonings away, which have lasted very long, until the vital spirit being almost overwhelmed recovered it self again.

Moreover in the fifth place, the opening the vein being indicated, and its time appointed, there remains still no little consideration to be had, what Quantity of blood is to be let out, in which point there is most commonly a fault committed, while some being too audacious, and others no less timorous, they affix those bounds on this or that side of which for the most part consists the Right. For that I may omit those who scarcely or not at all admit of Phlebotomy (as I have before hinted) so I cannot easily assent to their practice who fear not to draw blood to swoonings: Besides, an error of no light moment is committed within the moderate bounds, while in some cases blood is drawn by too sparing a hand, and in others with too free. In a burning Fever, Pleurisie, Peripneumonia, Squinancy, Frenzie, Apoplexie, and other great diseases, that have their origine from a turgescency or phlegmonic incurfion of the blood, a sparing Phlebotomy doth always more prejudice than advantage. For besides that it doth not remove the antecedent cause of the disease, to wit, the Plethora, it further causes the conjunct cause, viz. the inflammation and bursting out of the blood to be augmented. For truly it is a constant observation, that upon blood too sparingly drawn, the whole mass doth boyl up more notably, and doth acquire a new flux into the part affected; the reason of which is, that in a great Plethora many portions both of the Blood and Serum being thrust forward into recesses and strait places, are there constrained to abide; which, after the Vessels being a very little emptied, do impetuously regurgitate into the mass of blood, and do much disturb it, and force it more impetuously to and fro. Wherefore also in this respect the vessels ought to be very much emptied, viz. that besides freeing the former Juice from straitness, also space may be given to the Juice reduced from exile, which otherwise being not congruous, coming upon the blood, troubles it, and provokes it into effervescencies and eruptions. From hence we may observe, that almost all men grow more hot presently after Phlebotomy, and yet the blood being sufficiently evacuated, a little after they enjoy a more temperate condition.

But as a slender withdrawing of blood in some cases is not only vain, but is performed with prejudice, so in other cases too much effusion is rarely committed scot-free, and sometimes brings notable detriment of health. For when either strength languishes, or the body labours under a notorious Cachexia, we must spare Blood-letting, and its taking away is either prohibited, or being indicated by some accident, is allowed but in a small quantity. Wherefore in men endowed with a weak, tender and cold Constitution, and in consumptive persons, those affected with a long or malignant Fever, also in Hydropicks or Cacochymicks a vein is not rashly to be breathed, at least if it be, much blood is not suffered to be taken away. It will be an impossible thing to prescribe general Rules, according to the particular cases of every individual person, whereby the quantity of letting Blood may be exactly proportion'd according to the strength of the Disease and the ability of the Patient; but let this be left to the judgment of the prudent Physitian present, and let his Commands be ever exactly observed; And let not (as it every where is) such leave be given to Quacks, Empiricks and Barbers to play with humane life, who everywhere rashly and wickedly use Phlebotomy; and if the blood spring more freely and appear discolour'd, therefore bragging of the vessel being well pierc'd, they say it must be let out more plentifully, because it appears bad, when oftentimes on the contrary it ought to be spared.

As soon as the Quantity of Blood to be taken away is determined, our next care ought to be, that a more large orifice being made, the blood equally mixt may flow out as soon as may be; for otherwise, if it go out from a small hole, or drop by drop, or with a little stream, the mass of blood fermenting will separate into parts, and what is more subtile and spirituous will burst out, the thicker and feculent remaining behind. Hence it is to be observed, that the blood being let out of a large orifice with a more full stream, if it be a little stopt with the finger clapt on it, and a little after suffered to flow out, the blood going out the second time becomes much purer and brighter than the former, because in the interval of flowing, the more subtile particles being unfolded from the thicker, and accumulated together, have prepared themselves to fly away. Wherefore, if Hippocrates's Precept shall be observed, viz. to let

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The Quantity of the Blood to be taken away ought to be considered.

Too much Phlebotomy to be avoided.

But a more spare Bleeding often hurts and fixes a fever.

The Reason of which is declared.

In some cases the mission of Blood must be altogether avoided.

Phlebotomy ought ever to be done with a large orifice.

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let it run to the change of its Colour, it behoves us to procure that it spring out quickly, with a full and not interrupted stream. Besides all this, as to what appertains to the alteration of the blood let out, and cold, and to the inspection and the judgment thereof, for that we have often discoursed it in other places, we now pass it by, hastening to other things; and now the thread of Method leads us to entreat of Remedies opposite to Blood-letting, to wit, *Ischemones*, that is, those which are convenient to stop immoderate *Hæmorrhagies*, whether engendred by Nature or by accident.

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Of Remedies restraining or stopping of Blood.

Every Hemorrhage is not to be stoppt.

EVEN as Art imitates Nature in letting forth the blood by Phlebotomy offending in plenty, or temperament, or in its motion; so it succours her being diseased or working wrong, by stopping the flux of blood whensoever it is immoderate or hurtful. Whereas there are various and many species of an Hemorrhage, there is no need of Physick for them all. If perhaps a great effusion of blood happens by a solution of unity, excited by an outward accident, as a wound, or stroke, Chirurgery suggests the manner of Administrations whereby it should be restrained. Moreover an Hemorrhage as long as it shall be Critical, ought to be disturbed by no Medicine, but left to the meer government of Nature (as long as she does aright use her power;) and as to the Symptomatic, whilst it is little or not much troublesome, there is required no Physick: notwithstanding there is great need of it, if at any time the Flux of blood be either immoderate, or flow out by unapt places.

But only the immoderate and inconvenient.

Eruptions of Blood of this last kind chiefly challenge a Cure, if perhaps the blood be cast upward by Coughing or Vomit, or downwards by seige, or thrown off through the Ureters. For in these cases, though the quantity of the Blood excreted, be not much to be dreaded, notwithstanding because often a dangerous or mortal Ulcer enters the solution of the Unity so made in the Lungs, or in the Stomach, Guts, or in a Vein; therefore we must industriously rancounter those Hemorrhagies from their first appearance. Therefore amongst the Diseases of those parts, such bloody excretions are accounted; but we have already in another place delivered the Theories of Spitting Blood, and of the affection Dysenterical, and the reasons of healing them, so that there is no need to repeat them here; neither also to propound here a remedy for bloody Urine, for that it belongs to the Nephritic Pathology; wherefore we will pass to those Passions, for which by reason of an immoderate efflux of blood, there is great need of restraining Medicines.

The chief Cases of the latter are reckoned.

And also of the former.

For the present the Cure of the Hemorrhage of the Nostrils is only propounded.

The kinds of these Affections are chiefly three, viz. Hemorrhage of the Nostrils, of the Flowers, and the immoderate Flux of the Hemorrhoids: The Cure of which last doth belong more to Chirurgery than Physick, and I think it best to refer the other to the hysterical Pathologie. Here properly belongs to this place the blood flowing out of the Nostrils, being the most general kind of passions of that sort, and common to every Age, Sex, and Temperament, so that from the Diagnostick and Therapeutick of it duly assign'd, the uses and efficacies of Medicines stopping blood will best appear: for what we proffer for the unfolding the Causes and Cure of this bloody eruption, may be accommodated unto all other dreadful Hemorrhagies.

A description of the Vessels from which Blood flows.

It is observable enough, that the Flux of blood from the Nostrils doth happen to most men from extraordinary occasions; for as oft as the blood, about to break out through its own turgescency, or through laxity of the vessels, is apt in some place to make or find its way, it is, by a certain instinct of Nature, very often directed to the Nostrils, as to the part most easily opened. The vessels, from whence it flows in that place, are slips of the arterial Branch going from the Carotides, after having pass'd the Cranium, it comes to the basis of the Cerebrum; for this proceeding near to the mamillary Processes, sends very many twigs from it self every where about, of which some eminent ones passing the hole of the Sieve-like Bone with the smelling Nerves, are distributed through the glandulous membrane investing the windings of the top of the Nose. These nasal Arteries departing first from the Trunk of the Carotides within the skull, anticipate part of the blood chiefly serous from the brain, and lay aside the Serum it self and other watery recrements into

into the glandules of the Nostrils, as into the proper Emunctories of that Region, whence they distill into the cavity thereof. Wherefore, if the mouths of those little Arteries do always gape somewhat by reason of the sweating out of the Serum, it is no marvel if the blood it self being made more turgid, opening them a little more (which often are too loose of themselves) bursts forth of doors. Indeed this Emissary both of the Serum and of the Blood, being apt ordinarily to open, or on any occasion, prevents or cures great incommodities of the brain, or of the Præcordia, yea and sometimes of the whole body.

For in the first place, this way the Serum (as I said) is derived from the head, and when the mouths of those Vessels are vellicated or provoked by any sneezing Medicine put into the Nostrils, the Serum is from thence more abundantly drawn out; which yet doth not descend from the Brain (as is commonly thought) but is anticipated by these nasal arteries, lest it should go to it; from which when it is more plentifully drained and brought forth by the use of Errhines, for that cause the Brain becomes more serene and exempt from vapours. Then secondly, lest the Brain should be overwhelmed at any time by blood more impetuously overflowing, a portion hereof passing through these vessels and breaking out, easily prevents it.

But sometimes it happens that an Hemorrhage of this kind, rather becomes a Disease than a Remedy; for whensoever the blood flows out more often and more abundantly than is fit from the Nostril, if life be not immediately hazarded by reason of too great loss, yet the remaining mass of the blood being impoverished thereby, and losing its temper, acquires a cachectick and frequently an hydropick disposition; even as we have clearly intimated before, where we also have shewn the Ætiologie of this distemper in common with other two great Hemorrhagies, either to consist in the fault of the blood, or of the vessels, or of both together.

First, the blood bringing an Hemorrhage of it self offends either in Quantity or Quality; and therefore while occasionally it boils up, it cannot be contained within the vessels, but either opening their mouths by distending them, or unlocking them by its acrimony, it skips out: To which happens that the blood being sometimes dissolved in its consistence, and as it were infected, becomes unfit to continue the course of Circulation, inasmuch as portions thereof separating from one another, are partly fixed in the flesh or skin, having suffer'd death; and partly breaking out, stir up frequently dreadful, and sometimes mortal Hemorrhagies, as every where is discovered in malignant Feavers, and sometimes in the Scurvy. Notwithstanding the blood offending by meer Quantity or Acrimony, unless the fault of the Vessels happening thereon provoke the flux thereof, or too easily permit it, seldom breaks out into a great Hemorrhage.

Therefore secondly, the vessels bringing blood, as often as they conspire to produce that affection, are usually in the fault, either first inasmuch as their small mouths gaping, by reason of the fibres being too loose and weak, do not readily enough transvate the blood out of the Arteries into the Veins; which fault happens to scorbutick and cachectical persons; or secondly inasmuch as by reason of the same moving fibres being affected with the Cramp and Convulsion, the blood being snacht impetuously to and fro, and chiefly towards the Head, is constrained to break out to continue the thread of circulation, even as it will plainly appear in the case of a Patient which shall be shewn below.

As to the Prognosticks, although an immoderate flux of Blood, in the Small-Pox, Measles, malignant Feavers, and in the Plague, doth ever preface evil, and is expedient to be stoppt, notwithstanding it ought to be restrained not by meer cooling or revulsory things, but to be chang'd by temperate Hydroticks into sweating.

2. An Hemorrhage of the Nostrils, though not great, is more dangerous in Cachecticks with a weak Pulse, and a cold sweat, than a plentiful Hemorrhage in men endued with a Pulse strong enough, and blood very fervent.

3. They who are obnoxious to this Disease, by reason of a Dyscrasie of blood and looseness of the vessels, if there come upon both these a convulsive disposition of the fibres of the little Arteries, they receive a far more difficult Cure and frequently are reduced to extream languishings by reason of the great losses of blood.

4. From those who are feaverish, when much blood shall flow out of the Nostrils, and does not terminate the disease, oftentimes in the place of a Crisis a delirious or a soporiferous affection succeeds. There are many other prognosticks about a Hemorrhage accurately remarkt by Hippocrates, which notwithstanding properly belonging to the discourse of a Feaver, we omit in this place; for truly, the Cure in general of this Distemper is here almost only intended.

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About which there will be three primary Indications, to wit, *Curatory*, *Vital*, and *Preservatory*; the two former respect immediately the symptom to be stopt, as often as it shall be urgent; and the last is busie about removing the Cause of the Disease, that so the assaults of the Hemorrhage may be small, or not at all. Besides, an Hemorrhage ought to be handled one way without a Fever, and after a different manner if pressed with a Fever.

The Curatory Indication suggests three intentions of healing.

Therefore whensoever without a fever much blood shall flow out of the Nose, presently as there shall be need of stopping Remedies, there will be three chief intentions of Curing, all being together assumed into practice, *viz.* Let the turgescency of blood be bridled, that it may be less disposed into inordinate tendencies. Moreover in like manner let it be endeavoured, that as well its fluxion being withdrawn from the Nostrils may be diverted to another place, as that the mouths of the Vessels gaping within the Nostrils be shut: for which purpose Remedies as well external as internal very many and of diverse kinds are wont to be exhibited; of the former we will en- treat in order briefly.

Outward remedies to stop the flux of blood.

1. Ligatures.

First therefore let the Patient be quiet, plac'd with his head upright, then let many of the Joints of his Arms and Thighs, but not all, be bound with strait Ligatures, which ought now and then to be loosened and removed to other parts; for all being bound together and long, by reason of the blood being held in the outward parts, and too much detained from the heart, hath caused most dreadful swoondings; but otherwise this Remedy being prudently administred, frequently helps. For when the blood by this means running into the members by the Arteries is stopt, that it presently returns not by the veins, its more impetuous spreading it self into the head is impeded. Moreover, by the painful Ligatures of the Joints, the muscular Fibres of the Carodites Arteries are preserved from Cramps which oftentimes come upon them.

2. Bleeding.

Secondly, for diverting the tendency of blood from the Nostrils, it is sometimes expedient to breath a Vein in the Arm or in the Foot. For by how much more blood is carried by the Arteries to the vein cut, by so much less will the afflux be towards the Nostrils. Yet this administration does not always so help, but sometimes a contrary effect thereof happens, as we have already observed in spitting blood. The reason whereof is, that the vessels being suddenly and not sufficiently emptied, suck up again the disagreeable humours formerly ejected, and stagnating within the pores, whereby the blood incontinently is stirred up into a greater eruptive turgescency.

3. Application of cold things.

Thirdly, Cold things applyed to the Forehead and Temples, also to the Nape of the Neck, where the vertebral Arteries ascend, cause the vessels to be bound together, and the flux of blood to be somewhat stopt or repelled. Notwithstanding it is ill which some advise, that cooling Topicks be applyed to the Jugular Veins; for so the blood being retarded in its recourse, flows the more plentifully out of the Nostrils. Moreover, what is usual, to apply linty Cloaths, or a Sponge moistened with Vinegar, to the Pubes and Testicles, helps by no other means than the ligature of the members, to wit, inasmuch as the flowing back of the venous Blood is impeded. A sudden and unexpected sprinkling of cold water on the face, frequently stops an Hemorrhage, inasmuch as it gives an impression of terror.

4. Cupping-glasses.

Fourthly, Cupping-glasses applyed upon the Hypochondres, Flanches, inner part of the Thighs, and the soles of the feet, are accounted a famous remedy as well with the ancient, as with modern Physitians, for diverting a tendency of the blood from the Nostrils. And the reason is plain, *viz.* because a Cupping-glass being put on, the impulse of air being prohibited by the space of the orifice, and encreased every where about, presently the blood and humours, yea and vapours, and solid parts, being call'd from any other tendency, are driven towards the empty space of the Glass.

5. Frictions.

Fifthly, Rubbing of the extreame parts are commended in this distemper by some Practitioners, which we judge not always useful, nay scarce safe; because, although they solicit a greater appulse of the blood to the feet or hands, yet they so hasten the return thereof, that the whole mass of blood being raised into an effervescence, it hazards a more violent tendency towards the Nostrils.

6. Cauterics.

Sixthly, *Zacchus Lusitanus* among his revulsory Remedies, propounds an actual Cautery to be applyed to the sole of either foot; and *Crao* the bending the little finger of the same side, which because done with no trouble we may try; but we advise not so of the former, unless the way of helping were more certain, which might compensate the pain and lameness, that would ensue thereon.

Seventhly,

Seventhly, Swooning raised by any means, presently stops an Hæmorrhage, how-
ever contumacious it be; wherefore when such bleeding persons are taken out of
their beds, or when they do timorously admit of Phlebotomie; though but sparingly,
or have their members bound for a longer time, or are suddenly affrighted with
some feigned rumour, or by some other occasion fall into a swooning or fainting of
the spirits, the flux of blood ceases thereon presently. The reason whereof is evident
enough, for that as soon as the motion of the heart fails, presently the blood and spi-
rits rush thither, and so every outward flux is stopt on a sudden, and what was im-
moderate before, doth not again return.

Eighthly, In the last place, for repressing the flux of blood from the Nostrils, Reme-
dies ought to be recited, which are said to operate after an occult manner, by Sym-
pathy or Antipathy, of which sort first is the sympathetick powder, made of Roman
Vitriol calcin'd to a whiteness by the Summer Sun; also a piece of wood cut from
a young Ash first sprouting about the time the Sun enters *Taurus*; the efficacy of
which remedy in the late Civil Wars many worthy of credit attest to have been ap-
proved for stopping the Hemorrhages of wounded Souldiers: Yea some still with
much confidence prescribe it in all eruptions of blood. I confess the reasons of ef-
fects of this kind are concealed from me, if so be they happen often. Besides, it
seems not a less Empirical and irrational Remedy, that a silk Bag with a dry Toad
in it, worn on the pit of the Stomach, stops any kind of Hemorrhage, and prevents
its return: unless (according to the *Ætiology* of *Helmontius*) that the application
terrifying the *Archans*, compells the blood being astonished, either to go back, or
desist from its inordinate excursion.

There remain very many famous Medicines whose Operations are wont to be re-
ferred to hidden Causes and secret vertue; as are Necklases of Blood-stone hung
about the Neck, also the moss of a humane Skul carryed in the hand; Epithemes
of the leaves of Nettles bruised and applyed to the soles of the feet, and the Palms
of the hands; the Empirical administrations of which kind, when they may be admi-
nistrated without trouble or cost, we make no refusal of; since in a dangerous case
every thing is to be attempted; and applications of that sort do help sometimes in re-
spect that they fortifie the imagination of the Patient.

While such like outward Administrations are used, for repressing or calling aside
the flux of blood out of the Nostrils, also other Topicks are put up into the Nostrils,
which may shut the gaping mouths of the vessels, for which use the injections of liquid
things, Pledgets, Powders to be blown in, and Fumes are wont to be prescribed, which
not helping, in the last place we descend to Escharoticks.

Ninthly, Among Liquids, not only first, but as good as all others is esteemed the
solution of Vitriol in Fountain-water. Some boast this for a great secret, and a most
certain Remedy. Indeed the same being applyed to a fresh wound, forasmuch as it
shuts the ends of the cut vessels, by wrinkling them up, it restrains and presently
stops the flux of blood. But that application in Hemorrhages of the Nostrils,
where the blood being brought to the gaping mouths of the little Arteries, ought
to be received by the Veins, in regard it shuts them as well or rather than those,
it succeeds little, and sometimes not at all, as I have known it frequently experi-
mented. This Medicine is prepared of Green Vitriol, viz. of *Hungary*, or of our
Country, also of the fictitious Vitriol of *Mars* dissolved in a sufficient quantity
of Spring-water. I know some commend the solution of Roman Vitriol, which they,
not only apply by injection, but also to a linnen cloath dipt in the blood are wont
to administer it sympathetically. Moreover the water of the infusion of white Vi-
triol prepared with Bole and Camphire, I have known to be used successfully as well
in wounds, as often in other Hemorrhages.

Tenthly, Since water cast into the Nostrils, doth not adhere enough to the mouths
of the Vessels, but is washed away by the breaking out of the blood, before it can
exert its Vertue, it is therefore more expedient either that a Styptick powder be
Blown in, or that a Pledget dipt in the water of Vitriol, either by it self, or strewed
with an astringent powder, be thrust into the upper part of the Nostril. For this
purpose many and several kinds of styptick powders have been prescribed, I have fre-
quently used either *Crocus Martis* calcin'd to the highest redness, or the powder of
Camphorated Vitriol, or the vitriolic Soot scrap't from the bottom of an old Brass Pot,
the powder whereof I have often used with success in this case. In obstinate He-
morrhages not yielding to other remedies, let Pledgets, whose tops are dipt in Cau-
stick Colcothar, be put up deep into the Nostrils, that the mouths of the Vessels
being burnt, and covered with an Eschar, all flux of blood may be presently stopt.
Many other Errhines to stop bleeding are accounted famous with Practitioners, as

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7. Faintings.

Remedies by
Sympathy and
Antipathy.1. Sympathe-
tick-powder.2. Young Ash-
wood.

3. A dry Toad.

4. A Blood-
stone.

5. Moss.

Topicks closing
the mouths of
the Vessels.6. Escharoticks.
The injection of
Vitriol water.

10. Pledgets.

Hogs-dung.
Hogs-dung,

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Burnt Blood.

Hogs-dung, thrust into the Nostrils, which by the meer ill favour is thought to repell the blood; also the smoak of Blood dropping on hot Iron, repercuss'd into the Nose, the Powder being burnt is also taken inwardly. The moss of a humane Skull unburied, put into the Nostrils, is commended by many for this effect: but these latter applications ought to be referred to the sympathetick Ætiologie, if they avail any thing.

These things concerning outward Remedies stopping blood, the vertue and efficacy of which ought at the same time to be promoted by intern Remedies, seasonably exhibited and cooperating.

Inward Remedies, whereof are two intentions.

Therefore a slender Diet being instituted, and the Patient ordered to keep himself in an upright posture, or not much supine, while the aforesaid Administrations are orderly administred, medicines appropriated to the same end are also prescribed to be taken inwardly. There will be two scopes of Remedies of this sort, viz. 1. That the effervescency of Blood whether incentive or fermentative being suppressed, the liquor thereof being restrained within the vessels, may pleasingly circulate. 2. That the more impetuous motion of the heart driving about the blood too rapidly, may be depressed by apt Sufflaminas.

1. Things appeasing the effervescency of the blood.

1. The first Intention requires Medicines that suppress the too much kindling of the blood, and appease the undue fermentation thereof, for which intents I usually prescribe the ensuing Remedies.

Juleps.

Take of the water of Plantane, red Poppy, Purslain, and frog-Spawn, of each four ounces, Syrup of water-Lillies two ounces, Sal Prunella one dram, mix them for a Julep, the dose three ounces three or four times aday.

Tinctures.

Take Barly-water two pound, Red-rose leaves one handfull, Spirit of Vuriol what suffices to make it gratefull, or about half a dram, make an Infusion warm for extracting the Tincture, add Syrup of St. John's-wort two ounces: the dose three or four ounces, as oft as they please day or night.

Take leaves of Stinging Nettles, of Plantane, of each three handfulls, pour upon them being bruised Plantane-water 6 ounces, press them strongly, let the strained liquor be taken.

2. Intention, to cool the motion of the Heart,

Is done by Hypnoticks.

2. For the second Intention, to wit, for the cooling of the heart too vehemently beating, Hypnoticks and Opiates are convenient:

Take water of red Poppies three ounces, Syrup of Diacodium half an ounce, make a draught to take at night. Or,

Take Conserve of red Roses an ounce and a half, Powder of Henbane, and white Poppy-seeds of each two drams, Syrup of Poppeys, enough to make an Opiate. The dose the quantity of a Nutmeg every six or eight hours.

Take of Laudanum Cydoniatum one dram, the dose fifteen drops twice aday in a convenient Vehicle.

Of a Hemorrhage in a malignant Fever.

These things touching an immoderate Hemorrhage, and the Remedies thereof, when it happens without a Fever: but that which coming in a fever ought to be stopt in regard of the too great loss of Blood, is either Critical making an immoderate excursion, by reason of some accident, for which the Method and Medicines even now prescribed with caution and respect had to the Fever may be accommodated; or meerly Symptomatical, which being excited in a malignant and Spotted Fever, Small-pox, Measles, or the Plague, neither scarcely can, nor ought to be stopt with the Remedies aboverecited. For letting of blood is not convenient, repelling Topicks, also cooling Juleps, or Decoctions, and Narcoticks, have no place here: The chief intention of Healing will be to change the Hemorrhage into Sweating, for a gentle Sweat being raised, the flux of Blood often ceases, if it be not very dangerous.

Remedies.

Take water of Meadow sweet, Tormenvil, of each four ounces, Saxons cool Cordial two ounces, Treacle water an ounce and a half, Acetum Bozoardicum three drams, Syrup of Coral an ounce and a half, Confection of Hyacinths two drams, make a Julep, the dose six spoonfulls, every third hour.

Take of the Powder of Toads prepared half a dram, Camphire two grains, take it every sixth hour, with the forementioned Julep. Or,

Take Powder of Scarlet-cloth from half a dram to two Scruples, as before.

Take confection of Hyacinths three drams, Powder of Scarlet-cloth one dram, Syrup of Corals enough to make a Confection; the dose the quantity of a Nutmeg every other hour.

Take

Take of Bistort and Tormentil-roots, of each one ounce, the leaves of Meadowsweet, P. H. A. R. Pimpernel, Wood-sorrel, of each one handful, burnt Harts-horn two drams, Shavings of Ivory and Hart-horn, of each two drams, boyl them in Spring-water from three pound to two, adding about the end Conserve of red Roses three ounces; the dose three ounces being strained, often in a day. Part. II.

2. Hitherto of the first Indication Curatory, together with the scopes of healing and forms of Remedies, appointed for a Hemorrhage of the nose happening with or without a fever. The second Indication Vital only prescribes a slender Diet, temperate Cordials, and a fit handling of the Patient. The Provision of the first is so small and easie, that there seems no need to appoint a Measure and Rules for it particularly. About the latter the chief question is, whether we ought to retain them within or out of their beds. Without doubt the languishing, and those obnoxious to often swoonings, are not to be roused up, unless (as we have already hinted) it be for a Curatory attempt: as to others less weak, it seems so to be determined. Those whose Blood does not easily transpire by reason of the constipation of the pores, and is incited into a greater turgescence from the heat of the bed, and prone to break out, it will be expedient they not only remain out of bed while bleeding, but also sometimes through extern applications to be cooled in the whole habit of their body, or at least in most of their members. Wherefore, *Fabritius Hildanus* relates he suddenly cured one of a great Hemorrhage of the Nostrils, after many things tried in vain, by putting him into a vessel of cold water. Also with like success *Riverius* cured another affected in like manner, being taken out of his bed, and laid on a woollen Matt on the Pavement, he bathed his whole body with Linnen dipt in Oxycrate. Yet this method is not alike convenient for all persons, or at all seasons; but on the contrary, those whose blood is halituous, and enjoying more open pores doth evaporate easily, and being wont to be dissolved by a more moderate heat encompassing them, into Sweat, and from thence find themselves more quiet, it is more convenient that they remain within the bed, not only while the blood breaks out, but as long as there is danger of its return. For this reason it is, that many obnoxious to dreadful Hemorrhages, during the Summer, when they transpire more freely, live exempt from that disease, but the Winter cold pressing them, by reason of their pores being bound up, they suffer under more frequent and dreadful Invasions.

3. The third Indication Preservatory, which regarding the removing the Cause of that disease, either stops the eruptions of blood, or renders the same more rare, or less, and suggests these two Intentions of healing, viz. 1. That the blood being restored to its due temperament and mixture, may quietly circulate within the vessels, without turgescency and breaking out. 2. That the Vessels carrying Blood, as to the structure of their little mouths, and the tenours of the muscular fibres, may be contained in their due state; so that they neither cause those inordinate tendencies of blood towards the Head, nor suffer effluxes out of the nose. For both these ends, too great plenty and an impurity of the Blood are carefully to be provided against by Phlebotomy and purgation seasonably used; afterwards for procuring and conserving its good temperature, the following Alteratives may be given at fit seasons of healing.

Take of Conserve of red Roses, of Hipps, an. three ounces, powder of all the Sanders an. half a dram, Coral prepared one dram, of the reddest Crocus Martis two drams, Sal Prunella four scruples, with Syrup of Coral, make an Electuary, take the quantity of a Chestnut early in the morning and at night, by it self, or drinking after it three ounces of the following water. Forms of Remedies.

Take the tops of Cypress, Tamaris, an. eight handfuls, St. Johns-wort, Tamarisk, Horsetail, an. four handfuls, of all the Sanders bruised, an. one ounce, of the Crum of Whitebread two pound, slice them small, and pour on them of new milk eight pound, distill in a cold Still, sweeten each dose when taken with Syrup of the juice of Plantane.

Take leaves of Plantane, Brooklime stinging Nettles, of each four handfuls, to them bruised pour half a pound of the foregoing water, of small Cinnamon-water two ounces, press them strong, the dose three ounces to four, at Nine in the Morning, and at Five in the Afternoon.

Medicines of this sort are taken in Spring and Autumn for twenty or thirty dayes, with sometimes a gentle Purge coming between. In Summer let them drink Mineral Steel-waters for a Month, than which in this case there is not a better Remedy. Out of many Examples of persons labouring with an Hemorrhage, we only propose this one singular case.

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Part. II.

An Example of
a rare Hemor-
rhage.

Its Aetiology.

Its Cure.

I was lately consulted at a distance for a certain Gentleman that had suffered frequent and great eruptions of Blood, one while at the Nostrils, another while at the Hemorrhoid vessels. He had frequently used Phlebotomy by perswasion of his friends, without benefit; yea frequently falling into cold Sweats and Swoonings after breathing a vein, and notwithstanding obnoxious to eruptions of blood, he was wont to be much worse. I prescribed Juleps (having not yet seen him) and cooling Decoctions, and Anodynes, also the juicy expressions of herbs, and other things cooling the blood, but even from these, (as if all still far enough from the scope) he was nothing the better. At length being sent for into the Country to visit him, I found the affection under which he suffered to be meerly or chiefly convulsive; for whereas he daily bled, his Pulse was weak, the extreme parts cold, and all his Vessels as being too much emptied fell flat; also the Patient was affected with a continual Vertigo and trembling of heart, and by and by with a swooning or fear of it. Really the Blood was so far from breaking out by reason of turgescence, that rather the stream thereof being depressed and small, it seemed scarce enough to sustain the current of Circulation. Notwithstanding the truth of the matter was, he was often sensible of something in his body creeping one while upward, another while downward like wind, and for the most part the flux of blood out of his Nostrils or Hemorrhoids, followed the tendency of that motion: hence it was easie to conclude, that the moving fibres of the Vessels carrying blood, by which they are contracted, being affected with a Convulsion, did disorderly convey the stream of blood however small and low, to and fro, and so compell it into Eruptions: which also happen'd the easier, inasmuch as the mouths of the vessels being lax and gaping, suffered the blood forc'd into them to flow out without any due resistance. The instituted method of Curing did plainly approve of this Aetiology, inasmuch as it happily succeeded, leaning on this supposition; for Blood-letting, and the use of Medines stopping blood being at last omitted, I prescribed the use of the ensuing Powder, a dose whereof he took every sixth hour with a fitting Julep.

Take the powder of male Peonie, red Coral, Pearles, of each one dram, Ivory, Crab-eyes, Blood-stone of each half a dram, Lapis Prunella one dram, make a Powder, the dose half a dram.

Take of Black-Cherrie water eight ounces, Balm, Baryl Cinnamon-water, of each two ounces, Treacle-water one ounce, Syrup of Coral an ounce and a half.

But I commanded that Ligatures should be applied to certain places by a constant course, and by and by to other places as occasion should be given, as well to stop as to intercept the Convulsions of the vessels, and by remedies of this kind, and means of administration, he recovered his health in a short space, without any return of the disease.

SECT. III. CHAP. III.

Of Vesicatories.

Of losing Blood by Phlebotomy, whensoever it is troublesome and injurious, and swells too much, and tumultuates within the vessels; also of retaining it by Medicines stopping Blood, as often as being outrageous it rages too much of its own accord and flows out, we have hitherto largely discoursed. There remain other certain humours, viz. Nervous and Nutritious, as also Serous, and other recrementitious ones which are wont to flow within the Brain and Nerves, and as well in the nervous fibres, as the fleshy, yea and within the Pores of the skin and of the solid parts, which being often depraved or hindered in motion, require emission. being otherwise about to raise great troubles or pains, and frequently dangerous Diseases. Wherefore, that we may seasonably rencounter distempers that are about to rise or take their origine from thence, Physick hath found out certain other Emissaries, mediately or immediately deriving the forecited humours out of the parts and places where they shall offend. And those are either continual, viz. Fontinels of diverse kinds, which are as it were perpetual Drains, and pour out continually the Ichor;

Ichor; or they are temporary, when as occasion requires, the Scarf-skin being taken away in some part of the body, the extremities of the vessels in the skin are made naked, and withall so provok'd, that they spue out in great abundance the ferous humours of a various descent and disposition, and so continue to evacuate the same for some time, one while longer, another while shorter. But such a manner of drawing out the ferous humours from the outward superficies of the body or any part thereof, is wont to be procured by Medicines called by the Ancients *Phenigms*; or *Sinapisms*, by Moderns *Vesicatories*: of which in the first place we will treat here, (because the knowledge of these leads the way to the Doctrine of Fontinels) and we will chiefly insist on unfolding these three things; viz. First, It shall be shewn, from what Bodies, and after what manner disposed, Vesicatories are wont to be prepared. Secondly, Whereas they are of diverse kinds, it shall be declared what is the manner and reason of their operation in every one, or at least in the chief of them: Thirdly and lastly, we will make search for the curing of what sort of Distempers they ought to be appointed, and in what places applied.

1. As to the first, the most simple Blisterers are either Fire, or solid Bodies, or Liquors endued with fiery particles; (which are seldom administered for this use by reason of the terror which they impress, and the imminent danger, lest being more strongly apply'd, they do not only blister the Scarf-skin, but burn the skin and other parts.) Let therefore what is safer and less dreadful, Epithemes out of Concretes having more sharp and (as is affirmed) potentially fiery particles, be applied to the places to be blistered, which are either milder, and by the Ancients were call'd *Phenigms*, because they made the part red, the Scarf-skin taken away; or were call'd *Sinapisms* in respect of the matter, and were wont to be prepared of Mustard, Pidgeonsdung, Squills masht, Garlick, Milk of Figs, and the like; or they were stronger, and consisted of *Euphorbium*, *Cantharides*, *Flammula Jovis*, Crows-foot, greater Plantane, with many others, which being endued with a certain burning and caustick quality, are used outwardly, for the use above recited, but taken internally, they prove venemous and frequently mortal.

The composition and forms of things drawing blisters are reported to be manifold and of sundry kinds, although one or two may here suffice, and by how much the more simple, the better; and in most cases for the most part 'tis all one which you use: notwithstanding we shall after our manner annex some select Prescriptions of these kinds of Remedies. And that we may say little of *Dropaces*, *Sinapisms*, and *Phenigms*, whose use is almost exploded; almost all Vesicatories now in use have *Cantharides* for their Basis.

Take powder of *Cantharides* half a dram, to a dram, powder of *Ameos-seeds* one scruple, of old Leaven kneaded with Vinegar, enough to make a Plaister, spread some of it on Leather, apply it twelve hours to the place to be blistered. This works certainly and strong enough: but because it is long compact and sticking, and may fall from the place to which it is put, or is apt to crumble, therefore for the more commodious application, this following is very convenient, and now in use with most.

Take of *Cantharides* three drams, *Euphorbium* half a dram, powder of *Ameos-seeds* one dram, let be incorporated with *Melilote-Plaister* by a warm hand, as much of this powder as it is capable to receive, then spread it on Leather, and apply it for twelve or sixteen hours.

Some do use to incorporate the foregoing powder with *Burgundy Pitch*, and spread it upon Leather, afterwards to cover the sides with red Sanders incorporated with *Burgundy Pitch*, and so administer both a *Dropace* and a Vesicatory. Also by applying still the same Plaister, the Scarf-skin being blister'd and taken off, and the place being red, and ulcerated, and only wiping it once or twice in a day, and putting it on again, they cause the little Ulcer raised by the Vesicatory, to flow at pleasure, yea sometimes above a month, and to throw off a plentiful Ichor.

Others inclose *Cantharides* bruised, and sprinkled with Vinegar in Silk, and apply to the place.

Some Empiricks use in the room of *Cantharides* a mass of the leaves of Crow-foot, or *flammula Jovis* bruised on the place, by which the Scarf-skin being blistered, or rather eaten, the skin it self, as if toucht with an actual fire, is much inflam'd and deeply ulcerated; whence not only profusion of Ichor but an inflammation of the whole member, and a feaverish disposition sometimes follow: wherefore these things are not to be used rashly.

2. If it be enquired of the manner and reason how these and other Vesicatories operate; in the first place we ought to shew by what manner actual Fibres, and things endued

Vesicatories anciently called Phenigms and Sinapisms.

1. Of what prepared.

1. From actual Fire, or things imbued with it.

2. From things potentially burning.

A more delicate Vesicatory with a Dropace.

2. How they operate.

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Part. II.Shewed by the
example of Fire.

endued with particles proceeding from Fire, do raise a blister; then by an easie Analogy the force and manner of working of those sorts of remedies will be known, which are reported to be endowed with a potential fire. Wherefore we observe of the former, that the fiery particles not being too vehemently applyed, penetrating the Scarf-skin without dissolution of unity, enter under the skin it self, where the extremities of the vessels bringing blood, of the Nerves, and of the nervous Fibres are terminated; and there do variously twist together these, altering them from their position, and pervert the structure of the whole texture of the skin: insomuch that from all the vessels being made angry in a high degree, the watery humour being imbued with igneous particles, and therefore rejected, as well by the blood as by the nervous Juice, is spued out in great abundance: This Lympha, because it cannot pass through the Scarf-skin, separates it from the skin, and raises it into a bladdery bulk, from which at length being broke of its own accord, or occasionally, it flows out. Moreover as long as the igneous particles adhere to the skin, and the mouths of the Vessels, being covered with an Eschar, are not closed up, these being continually twitched by them, do continue to spue out the Ichor. This kind of ichorous flux will the sooner cease, if immediately upon the hurt inflicted, the fiery particles be drawn out, by the application of some proper Antipyretick, as Fire it self, Nitre, Soap, Onions, and the like. Moreover it runs the longer, if omitting an Antipyretick, medicines hindering the generation of a Cicatrice, or of the outer-skin, and unlocking the mouths of the vessels, be worn upon the place affected.

How Cantharides excite Blisters and draw forth water.

By these it is easie to understand by what manner Veficatories perform their operation, viz. Cantharides (as likewise any other of the same vertue) being outwardly applyed, and being heated by Effluvia's of the parts subjected, and so being provok'd to exert their power, do plentifully dispatch sharp and as it were fiery particles from themselves, which penetrating the Scarf-skin without any tearing it, they are dashed against the *Cutis* or other skin, where first they act upon the Spirits, and then by the affecting these, upon the Humours and solid parts. They very much provoke the Spirits, and drive them into painful Convulsions of the Fibres, dissolve the Humours, and constrain them to separate into parts; so that the watery part being very much embued with those sharp, and as it were venomous particles, is rejected every where by the other Juice; and when in the mean time the ends of the Vessels and Fibres are either eaten by the burning, or opened by twitching, and as it were drained, that Ichor conveying the hurtful particles is plentifully spued out of their little mouths; which then separates the impervious *Cuticula* or the Scarf-skin, from the other skin or *Cutis* it self, and raises it into a little bladder, and after this being broken and taken away, it is for some time poured out by the ulcerated skin (as we shewed it to come to pass by reason of the particles of fire.)

Why they bring a fervent Dysurie.

But this is not only done, because the serous Juice imbibing the sharp parts of the Medicine, and conveying them out, doth not alwayes bear them all back the same way by which they entred, but sometimes this being endued with these stings, regurgitates into the mass of Blood; and afterwards being circulated with it, and ejected with its infestous burden through other Emunctories, offends some weak or tenderer Channels in its passage or going forth; from whence very many contract a Strangury, from great or many Veficatories, by reason of the urinary passages being affected for that cause with Acrimony or Erosion, which in some becomes most sharp and intolerable. Also that application sometimes brings bloody Urines to others afflicted with the Stone; hence a suspicion also arises, that those who have tender Lungs, or who are subject to a Consumption, are much endangered by this Medicine outwardly applyed; which notwithstanding I have not known happen to any; but can rather attest by frequent experience on the other side, that it redounds to advantage rather than hurt. For the more sharp particles of Cantharides, if they be long applyed, being sometimes imbibed more plentifully by the blood, infect its whole Serum: which Juice so sharpened, as long as it is confounded with the Balsamick blood, hurts no part; but being separated from it by the Kidneys, it sometimes brings hurt to them, and frequently not only twitches the neck of the Bladder by its Acrimony, but sometimes corroding it, causes filth, and little skins, nay and blood to come away: but in the mass of blood, the same more sharp, saline-volatile particles do often most notably help; inasmuch as they destroy the fixt or acid Salts in it, and unlock the consistence of the blood too much bound up, and so do cause the serous and other morbidic recrements before wrapt up with it, to be separated from it, and to be more easily dispatched by Urine and Sweat; hence Veficatories being applyed long in Feavers do call forth plentiful Urine and a more easie Sweat. Also they open the obstructed wayes, and move together the portions of Blood or Serum

Veficatories move Sweat and Urine.

Serum, stagnating or being extravasated in any place, and restore them to their Circulation. Wherefore they are not used only to help in serous maladies, but also in those of the blood, yea in a Pleurisie, Peripneumonia, and in any other Feavers.

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Having hitherto shewed after what manner Vesicatories operate first on the Spirits and then on the Humours and solid parts, it is now our business in the next place to shew both the good and evil effects of them, as also the manners of using them. But that they in the first place operate on the Spirits is manifest from hence, that they exert no Power on the diseased, and it is an ill Omen in those that are languishing, when Vesicatories have no operation, because it is an Indication that the Animal Spirits are much dejected, or abundantly diminished.

Therefore, it behoves to consider about the due unfolding the energy, force or virtue of this remedy, what humours it either immediately or mediately evacuates or alters; and afterwards in what Diseases, and bodies how disposed it either profits or hurts.

First, As to the former, the humours that are immediately sent out by a Vesicatory, drop forth partly from the pores and glandules of the Skin, and partly out of the mouths of the little Arteries, and partly out of the extremities of the Nervous fibres; perhaps some little of the Juice newly received, out of the mouths of the veins, though not much, seems to be carryed. The humours mediately drawn out by a Vesicatory are those which the aforesaid parts being emptied receive elsewhere, and derive them forth.

1. As to humours of the Skin.

1. The Skin is a thick Membrane consisting of a double Coat, very porous, also thick set about with most numerous glandules, with fat, as also the ends of the Vessels and fibres being terminated therein, and thickly woven one within another. Wherefore, while a portion of it is made bare, the Scarf-skin being taken off with a Vesicatory, and the nervous fibres being twitched, do bind together, and wreathe the glandules and pores, the serous humour contained in both, is most plentifully squeezed out. And whereas some pores are previous into others, the Serum doth not only flow out of the place blister'd, but sometimes into the little holes first so emptied, a portion of the Serum coming from the neighbouring pores succeeds, and thence by and by sweats out: wherefore in Patients affected with an Anasarca, the little ulcers raised by a Vesicatory, exhaust the waters every where in great plenty, and draw them out of the neighbourhood, yea and sometimes at a great distance.

2. The little mouths of the Arteries being uncovered and twitched about the blistered place, do not only vomit out a portion of the Serum brought to them, by ordinary custom, but the serous liquor being imbued with the Stimula of the medicine in the whole mass of blood, immediately is separated more plentifully from the blood; and at every turn of Circulation a greater plenty thereof is thrown out by the same mouths of the Arteries continually irritated: Moreover together with the Serum as it were so stagnating, and therefore removed from the whole blood into the little ulcers of the skin, other recrements and sometimes the morbid matter it self depart in plenty, and are dispatched forth by the same Emissaries; and for this reason in malignant feavers, yea in some putrid, that are difficult to be judged of, when the recrements and corruptions of the blood, unapt to be thrown off, do threaten the Præcordia or Brain, Vesicatories continually and leisurely draining it, do frequently yeild notable relief; whereunto we may add, that they do also alter and restore (as we before mentioned) the blood degenerated or depraved as to its Salts, and also by opening or subtilizing its consistence, dispose it towards an Eucrasie; wherefore, not only in a feaverish state of Blood, but also in a state otherwise peccant, or of ill Juice, this kind of remedy is often extremely convenient.

2. In respect of the blood.

Which they purge and alter.

3. Both reason and experience have enough proved, that Vesicatories evacuate a certain humour from the Nerves and nervous Fibres, and for that cause profit very much in convulsive distempers: For surely we have in another place clearly enough demonstrated, that the watery liquor of the Brain and Nervous system, doth sometimes abound with heterogeneous Particles. Also it is manifest by frequent and familiar observation, that the impurities and recrements of that liquor, together with the watery Juice, do spontaneously sweat out from the Nerves and Nervous Fibres, when the fluor is raised, and either restagnating within the mass of blood, are carryed off by Urine or by Sweats, or being deposited within the Cavities of the bowels, are dispatched by Vomit or Stool. Wherefore, when a Vesicatory is applyed, the extremities of the Nerves and Nervous Fibres being made bare, and very much angred, immediately a humour abounding near their ends is voided; and also the whole Juice planted within their passages by a long succession, is chased, and delivered from

3. In respect of the Nerves and of the humours abounding in them and in the nervous parts.

PHAR. from stagnation; and the heterogeneous particles mixt with that nervous Juice, being every where agitated and derived from the Brain, slide towards their newly opened Emissary, by degrees, and at length are removed wholly forth.

For the curing of what Diseases Vescicatories are convenient.

Is in all cutaneous Distempers.

2. They take away the impurities and ill temperament of the blood.

This Remedy is profitable in those Diseases which the blood produces in other parts.

3. Also in all Distempers of the Brain and of the nervous Stock.

For what diseases, Vescicatories are intended.

In what Constitutions they agree best.

From these things we may collect, for the cure of what Diseases this kind of remedy doth chiefly conduce; for by reason of its evacuation out of the pores and glandules of the skin, as often as any serous, salt, sharp, or otherwise hurtful humour is collected in those parts, or their neighbourhood, and being excluded from the Circulation of blood, shall obstinately stick in that place, surely there is no more ready or easie way afforded for drawing it forth, than by applying a Vescicatory, upon or below the place affected. Wherefore, it is not only indicated by an Anasarca or by any foulness or eruptions of the Skin, but moreover a Vescicatory is required for pains either arthritical or scorbutical, fixt any where in the extern habit of the body, or in any certain member.

Secondly, In respect of the Blood, Vescicatories are always used in malignant Feavers, as well to purge out leisurely any heterogeneous or morbid matter, as to change it from a disposition either too acid, or salt, or otherwise peccant, into a right temperament; yea they are of most excellent use in all putrid feavers of ill habit and hard to be judged of. Also for that cause in the Scurvy, Leucophlegmatia, *Pica Virginum* or Green Sickness, also in any other ill habit of body, this kind of remedy affords frequently notable help. Moreover not only for the sake of correcting the blood itself, but besides as often as it being depraved spreads its corruption on other parts, and so doth first beget diseases in the Head, the Chest, the nether Belly, or Members, and then excites their Fits, Vescicatories are usually exhibited with success. Wherefore it is a common remedy, in Head-aches, a Vertigo, and soporiferous affections, no less than in a Catarrh, or any defluxion either into the Eyes, Nose, Palate, or Lungs, in which every one without consulting a Physician, will prescribe to themselves Cantharides for Revulsion. I confess, when I have often been surprized with a great Cough, with abundant and thick Spittle (whereto I am originally obnoxious) I have received relief from no other Remedies more than from Vescicatories; wherefore I am wont, while that distemper doth urge, to apply Medicines drawing blisters first upon the Vertebra's of the Neck, then those little Ulcers being healed; beneath the Ears, and afterwards if need require it upon the Scapula's; for so the serous filth loosened from the consistence of the blood sweating forth, is derived from the Lungs, and also the mixture of the blood sooner recovers its temper, inasmuch as after this manner its enormous salts are destroyed.

Thirdly, In respect of the Humour, *Epispasticks*, as they are of most common use, so they are wont to confer great help, in soporiferous, convulsive and painful distempers, for deriving and evacuating it out of the nervous stock and the brain itself. Was ever any surprized with a Lethargy, Apoplexie, or Epilepsie, but that immediately Friends and Attendants however unexpert, have tormented his Hide with the application of Cantharides? In stupendious convulsive motions, ascribed usually to nothing less than Witchcraft, I have applied Vescicatories with great benefit in many parts of the body at once, and I have continued them above a Month, presently renewing them in fresh places. And also pains that are fixt and most fiercely tormenting in the membranous parts, are seldom cured without this administration. For sometimes morbid humours and Particles which being deeply radicated, yield nothing at all to Purgers or sweating Medicines or Diureticks, yet have seemed to have been pulled up by the roots by Vescicatories, as it were remedies laying violent hands on the disease.

But this Remedy although most general is not used to operate so easily and happily in some Diseases and Constitutions; wherefore we may not rashly or indifferently use it towards all persons. For those who are Nephritick and obnoxious to a frequent and painful Strangury, scarce ever endure the application scot-free; wherefore, on those that are so affected we must not use Vescicatories, unless in malignant Feavers or acute Cephalick Diseases, for avoiding the greater Evil.

As to what relates to the various Temperaments and Constitutions of men in respect of which Vescicatories are used to be more or less convenient or advantageous: Concerning these, this threefold notable difference occurs. In the first place, some persons for the most part endure well the use of this Medicine, and the little Ulcers raised thereby in the skin, sweat out an Ichor sufficiently plentiful without any Dysurie, or great inflammation of the place blistered; and then heal of their own accord; which effect succeeds only in blood of a good temperament, where, to wit, the Salt and Sulphur being moderately and rightly constituted, there is present and abundant plenty of Serum; whose Juice easily and more largely separating from the rest

of the blood, carries away the sharper particles of the Medicine imbibed with it self, and partly sweats them out through the place blister'd, and partly conveys them out without prejudice by the Urinary passages; therefore also the advantageous effects now recited are produced in the mass of blood.

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2. But secondly this remedy with some doth neither well agree, nor operate profitably; because it rubifies the place very much to which it is applyed, or rather excoriates it with most fierce pain and great inflammation; notwithstanding the little ulcers made in the same place, although they do for some time torment the Patient, yet pour out very small or scarce any Ichor: Also to these always blister'd with torment, for the most part a violent Strangury happens. The use of these Vescicatories being troublesome and unsuccessful, doth frequently happen to men of a choleric and hotter temperament; whose blood is endowed with a plentiful Salt and Sulphur, and a small quantity of Serum, being more thoroughly concocted with the rest. Wherefore, when the Juice that ought to carry away the more sharp particles of the Medicine, doth neither easily nor plentifully pass from the rest of the blood, (that it may speedily wash them out) those particles sticking still in the skin, do as it were infect and impoison the blood it self, passing thorough, and for that cause being impeded from its circuit, they cause it to stagnate, and to be gathered together about the extremities of the Vessels, whence they are inflamed. Moreover the serous Juice being separated by the Kidneys when of it self it is little and sharp, and besides becomes stinging from the particles of the Medicine, it irritates the Neck of the Bladder, and frequently corrodes it by its acrimony.

Also in whom not.

In men of a more hot temperament they torment the part, and do not draw forth the water.

3. There remains a third Case although more rare, relating to blistering, to wit, in whom little Ulcers being raised in the skin, presently pour out the serous humour in so great abundance, that in a little time it will be necessary to give repelling Medicines, and that shut the mouths of the Vessels; otherwise, from too much flowing out of waters, a dissolution of strength, and a fainting of the Spirits are in danger to ensue. This I have known so constantly happen to some Patients, that afterwards I was fain to restrain their use of Cantharides although there was need of them; the reason whereof seems to be, that the blood being endowed with a salt Serum, and more sharp than it ought to be, hath a consistence too easily dissolved: wherefore, that serous juice being sharp, and fretting of it self, as soon as it is provok'd by the particles of the Medicine loosening the consistence of the Blood too easily dissolv'd, immediately breaking out with violence from the mass of blood, wheresoever there is a passage afforded, it flows out with a full torrent through the mouths of the vessels gaping in the blistered place. Besides this too much flowing out of the Serum, raised from the first application of the Vescicatory sometimes happening late in malignant Feavers, and in others ill, or not at all judged, and remaining a good while, wholly consumes the morbid matter, and delivers the Patient from the jaws of Death. In such a Case after the little Ulcers for the first days have poured out little or a very small quantity of Ichor, at length Nature attempting a Crisis by this way, a vast flux of Serum flows out from the same, and so sometimes for many days, nay weeks, continues to flow out until the Patient before accounted desperate, recovers his entire Health. Little Ulcers so abundantly flowing, as it is not easie, so it is not safe to stop them before the whole Mine of the Disease be consumed. Not long since, a famous Doctor of Physick in London, scarcely recovering from a malignant Feaver, did copiously sweat out Ichor daily from places blistered in several parts of his body; after some time (they being troublesome and tedious) he did apply stronger Repercussives to them all, and immediately restrained their flux. Those fluxes were scarce two days stopt, but his disease revived, and on the sudden he was affected with fainting of Spirits, and often swooning, a cold Sweat, and a low weak Pulse: and whereas he could not be relieved by any Remedies, however cordial they were, he dyed within three days; the cause of which seems to be, that the malignant matter being suddenly repercussed, fell into the Cardiac Nerves, whose action being hindered, the vital function quickly failed.

In others, inasmuch as they draw forth too much Ichor, they are not profitable.

The ulcers of Vescicatories do sometimes plentifully flow in Feavers, and give Judgement of the Disease.

They are not to be cured.

An Example is shewn.

P H A R.
Part. II.

SECT. III. CHAP. IV.

Of Fontinels, or Issues.

Issues rather a
preservatory
than curatory
Remedy.

Besides Vesicatories, which being as it were the extemporaty Emissaries of the Serum, and other humours externally to be brought forth, are only raised upon some occasions, and then after their efficacy a little shewed, are permitted to be dried up; there are others esteemed as it were continual Fountains, therefore named *Fonticuli* or Issues, out of which the Ichor or serous humour flows with a constant Spring. Those former, as they are requisite for the most part for Cure-sake in acute or other Diseases, whose morbidick matter requires a quick dispatch, in the first place respect the conjunct cause of the Disease to be removed; and therefore being more broad, are made only superficial, that such little Ulcers being large, may evacuate much, and then easily be healed: but on the other side, Issues being chiefly indicated for preservation, are ordained to remove or vanquish the procaccious cause of the Disease: wherefore they consist of a more narrow orifice, but made more deep through the thickness of the whole skin, to the end, that while they send out the morbidick matter in lesser quantity, they may derive it further, and continue longer to purge it out.

About these
three things are
to be enquired
into.

There are three chief heads of disquisitions concerning Issues, viz. First, what humours these Emissaries chiefly evacuate, and whence they bring them: Secondly, in what Diseases or Constitutions they better or worse agree: Afterwards, Thirdly, in what places, in what form, and with what instruments they ought to be made.

1. What hu-
mours they eva-
cuate.

1. As to the former, Issues, like Blisters, purge out all humours fixt within the skin, (although in a less compass,) or brought through it as well by the sanguiferous, as nervous Vessels, not only as they provoke, or as it were suck the outer superficies of the skin, but by piercing through the whole hide or skin, they convey out whatsoever flows from the sides of the orifice through the broken Vessels, also whatsoever slides down elsewhere beneath the orifice. Wherefore not only humours accumulated within the pores of the skin, or glandules, or brought thither by the Arteries, or Nerves, have conflux to Issues; but moreover the serous recrements under the skin, that are wont to be transferr'd, or creep between the interspaces of the muscles and membranes from place to place, tend every where unto them and find passage. Moreover an Issue appointed in the way anticipates morbidick humours, which were formerly wont to be conveyed to other weak and long afflicted parts, and by such means exempts one while this part, another while that, from their invasion. Hence either a Gouty, or Nephritick, or Colick matter, and sometimes a Paralytical, or otherways scorbutical, are frequently intercepted by Fontinels, in their passage from their Source to their nests or places of residence, and so are conveyed forth, and the usual assaults of a disease declined: Neither doth this Emissary less purge from thence by degrees the humours impacted in any part or region of the body, and there causing prejudice, than water-furrows made for derivation of moisture, and so prevent or cure a sickly disposition.

2. In what
diseases they
chiefly prevail.

2. From these several accounts of assistance, whereby Issues in general are wont to help, it is easily collected, for what distempers they are chiefly required; for although there is scarce any disease happens, wherein this remedy is either hurtful or unprofitable, notwithstanding it seems rather more necessary in some cases than in others. It is commonly prescribed for almost every disease of the head, whether outward or inward: Every one of the ordinary people procures an Issue as equal to all other Remedies, for the Convulsions of Infants, or Youths, for Sore-Eyes, Kings-Evil, as also for Head-ache in persons adult or ancient, for drouse, vertiginous or Cramp-like distempers. Neither is it less celebrated against diseases of the Breast; As who is obnoxious to a Cough, bloody or consumptive Spitting, or an Asthma that long enjoys his skin whole? In like manner Issues are commended in affects of the lower Belly; scarce any Hypochondriacal person or Hysterical woman, in like manner no Gouty or Cachectical person, but hath his skin pierc'd in many places like a Lamprey. It would be a vast work to recount here particularly all the Distempers for which Fontinels are helpful.

3. In what
Bodies they a-
gree not.

3. But really this Remedy, however advantageous and benign of it self, does not agree with all persons, nor is it indifferently to be prescribed to every one. For there are two sorts of men, which though sick, are to be excused from Issues, inasmuch

as this Emissary evacuates too much in some, and too little in others, or less than is convenient; and in the mean while remains very painful and intolerable.

Sometimes a Fontinel is not convenient, because it too much evacuates or consumes the Humour or Spirits. For I have observed in some, that an Issue made in any part of the body, pours out an immoderate quantity of Ichor, and peccant in quality: for out of it by often turns, if not continually, a watery, thin and fetid Juice, oftentimes discolouring the Pea and Coverings with blackness, flows out in great abundance, and so the strength and flesh is impaired by too great an Efflux thereof.

The reason whereof seems to be this, that in some persons endued with an ill disposition of blood and humours, a wound being made and hindered from healing up, generates straight ways into a filthy and malignant Ulcer; the sides whereof put on the nature of acid corruptive ferment, whereby the portions of blood continually forced thither, are so tainted and dissolved, that the Serum thereof imbued with the dissolved Sulphur, and other Corruptions, being refused by the Veins, flows out there copiously. Moreover, this putrifying pollution of an Issue being communicated to the blood, depraves in some part the whole mass thereof, and so at least (as also by too much loss of the ferous Juice) it is rendered less nutritious: Besides, from the Sulphur of the blood dissolved near the sides of the Issue and flowing out with the Serum, the streaming Ichor doth so stink, and black the Covering. Sometimes an Issue pouring out the ichor not immoderately, consumes the spirits and strength more than it ought, which really we take cognisance of from the effect, and sometimes not till afterwards; inasmuch as some, while they bear about them one or more Issues, remain feeble and lean; but they being stopt presently become vigorous and more plump. Moreover, it is a common observation, that many from an Issue raised near the head, have been presently surprized with a certain defect, and weakness of sight, inasmuch that they have been constrained immediately to heal it up: which seems to happen for this cause, for that where the provision of spirits is small, and their consistence very thin, the small losses of them, or of the Juice from whence they are procreated, if so be they are constant, are difficultly endured.

But in another and different respect, Issues like Vesicatories are forbid to some, or very cautiously prescribed, for when they evacuate little or nothing at all, they very much vex the place, where they are made. For in persons endued with a cholerick, or hotter constitution, the mass of blood being thicker than it ought to be, and less diluted with Serum, becomes more bound in its consistence; in these the solution of Continuity being made and kept by reason of the Issue, the blood it self (for that it doth not sufficiently discharge its Serum, whereby it may go away) sticks in the passage, and so being extravasated, causes a very painful inflammation; and in the mean while, as it pours out little Ichor, it remains as well unusefull as troublesome. The operation and uses of Fontinels and their indications being designed, we shall shew in what place, in what form, and with what instruments they ought to be made, and after what sort to be managed.

The places are appointed according to the ends or intentions of Curing by them, which chiefly are these three, viz. 1. A general Evacuation of humours from the whole body. 2. An Evacuation and also a revulsion from some particular member. 3. An Evacuation and also a derivation from some particular member. In respect of the first it is expedient that an Issue be made in the left arm; The second Intention requires it far from the part affected, and the Third near the part.

For these ends, viz. one while for this, another while that or the other Fontinels are made in all parts of the Body, viz. in the Head, Breast, Abdomen, in the Arms and Thighs, and in most parts of each of these, either by Incision, or Caustery, or piercing through, and in their holes or orifices Pease, or wooden Pease, Pellets or Pledgets, are put to keep them open. We will observe the principal places and kinds of Issues by running through the members of our body.

1. A Fontinel is prescribed by some to be burnt by a Caustery in the Coronal Suture, and is commended for exhausting and evacuating humours out of the brain and its outer Coverings. Although some use this in familiar practice, yet I have found by experience in some it doth less happily succeed, inasmuch that I have ordered many Issues to be stopt that have been made on the top of the head, being instructed herein from Reason and Experience; for that the blood transferrs more fecundity towards the place where it was wont to lay aside its recrements, and deposits them in the whole vicinage, and chiefly in the part affected, (as being the weaker and more susceptible part) whence a Disease is oftner augmented than cured. For the same reason, viz. for the derivation of the humours from the inner head outwards,

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Viz. First
where they evacuate too much.

why they often
pour out the
humour too
much.

why they ex-
pend the Spi-
rits too much.

Issues are like-
wise inconve-
nient when
they evacuate
less than they
should do.

The places of
Issues are de-
signed, accord-
ing, as the ends
are Evacuation
General, or Se-
condly, Evacu-
ation and Re-
vulsion, or both
that and deri-
vation.

1. In the Co-
ronal Suture.

PHAR.
Part. II.*Issues in the
fore and hinder
part of the head.**Between the
Shoulders.**which are pro-
fitable in many
diseases.**An Issue in the
left Hypochon-
drium.**In the Groin.**In the Thigh.**A fit place in
the member to
be chosen that it
may be made
far from Vessels
and Tendons.**Symptoms acci-
dental to Issues
how to be cured.*

some form Issues in the fore-part of the Head over the sagittal Suture, others in the hinder part of the Head about the beginning of the Lamboides, but the same exception remains against both as the former. And doubtless more rightly doth an Issue in the Arm anticipate the morbidick matter that is wont to be deposited about the head, or makes revulsion in the Thigh, and raised a little beneath the head, derives from thence. For this reason in painfull distempers of the brain, and Meninges, we cut a deep hole in the Nape of the Neck in Children and Youths; but for those grown up, and Old men, we apply Cauteries on either side the Spine between the Shoulders or the Homoplates, and in the same places we make incision for two Fontinels capable of many Pease, often with very great success. As to holes cut or burnt behind the Ears, or a Seton with a skane of Silk drawn through the Lobes thereof, I have seen them rarely with any success, but often very troublesome: Inasmuch as a solution of Unity made in these places, neither discharges much Ichor, nor for any long space; for though the hole or orifice be fill'd with a Pease, or Pill, it will be covered in spite of all endeavours to the contrary by the Cuticula, or skin growing under.

Issues in the back do notably help diseases not only of the Head by Evacuation and derivation of the morbidick matter, but also in all Gouts, Stone and Colicks, by anticipating the fuel of the Disease, and by intercepting it while it tends to its seats: which really is plainly proved by experiments and observations taken from the help of the Patients.

Fontinels between the Shoulders, also in the Arm or Thigh, conduce to the evacuating or anticipating, in pectoral Diseases, the humours flowing to the Lungs, and to the drawing back those deposited there. How an Issue cut in the Chest between the Ribs doth sometimes more immediately derive the consumptive matter from the Lungs, we have elsewhere shewed.

The Region of the Abdomen seems unapt for bearing an Issue in any part thereof; notwithstanding the practice of some, although it be more rare, is much fam'd for a large Issue capable of many Pease to be burnt with a Caution upon the Region of the Spleen for any hypochondriac affection. I have known it of small benefit to some, at least not recompensing the trouble and pain of such a remedy.

Some time since I successfully cured a weakness in the Loyns obstinate to all other remedies, by a Fontinel in the Groin, and in another Patient an inveterate Sciatica. For surely the glandulous Emunctories settled in that place, do imbibe very many recrements of the blood and nervous Juice; which if they be thoroughly and continually discharg'd from them by a fit vent, it will much conduce to exempt the contiguous parts from any morbidick Mine.

The Thigh being a member soft and large in bulk, seems apt enough for enduring many and great Issues, to wit, those which may purge away plentiful humours from the whole body. Yet it doth not succeed so with many Patients, partly because of its figure too much declining, like a Cone invers'd, the Ligature containing the Pease in the orifice is not easily kept on, and partly because a solution of the Unity being made among the concurrence of so many Tendons, it frequently becomes inflamed and painful; insomuch that sometimes it hath been necessary that it should immediately be stopt up, to withdraw the trouble of pain and of lameness. Notwithstanding it succeeds better in some Patients, for that an inflammation doth not always ensue upon the place where the incision was made, and that the Ligature has remained immovable to those that tie their hose above the knee.

Moreover, as concerning Issues, it is requisite to choose a convenient place not only in the body, but also in the very member where incision is made, which chiefly calls for the judgment of an expert Physitian or Chirurgion; for careful provision must be made, lest a Caution or incision be made upon, or too near the Tendons or greater Vessels; but let the Fontinel be made not in the very body of the muscle, but in the interspace or distance between the muscles where the orifice, as John Henrinius learnedly observes, ought to pass through the whole skin so far, untill the little membrane of the muscle underneath be penetrated. Wherefore this part of Chirurgery is not rashly to be allowed to Quacks and others ignorant of Anatomy, for that from this being ill done, not only a frustration of the benefit, but from thence frequently great mischief happens, and sometimes to the hazard of life.

It is not needful to describe the figure and use of the cutting Instrument, together with the manner of preparing and compounding Causticks for making Issues, inasmuch as it is notorious to the common people; yet it behoves us to handle in what manner the symptoms which happen to these Emissaries after they are made, may be cured, and it will not be besides the matter to discourse, what do either impede or pervert their powers.

Whereas

Whereas many and several distempers happen to Issues, help is not required for them all, but only for such as are of greatest moment: Wherefore there will be need of help. 1. Wheresoever an inflammation ensues upon the part or place where it is. 2. If the Orifice vent more or less Ichor than it ought. 3. If the Ulcer shall be apt spontaneously to be dried up, and cover'd over with a skin: or if it be prone to abound with spongy flesh growing about the sides. As to lesser faults, as when the Ulcer shall break forth into frequent Hemorrhagies, or change its place creeping into another less convenient, with many other ways by which it prevaricates, it will not be worth our labour to discourse here.

1. An inflammation frequently happens to an issue, and that so painful sometimes, that it threatens a Sphacela, yea and sometimes causes one. But such an affection ensues either upon the orifice new made, or happens afterwards by reason of the blood and humours, occasionally agitated and rushing frequently and in heaps to that part.

When a Fontinel is made, immediately by reason of solution of the Unity, and consequently by reason of the circuit of blood somewhat hindered in that place, a certain inflammation and ulcerous pain happens to some Patients; but in some endowed with a fervent blood, and whose Serum is less diluted, this ensues much fiercer. For the blood being brought thither by the Arteries, the ends of the Vessels being cut off and obstructed, it can neither go out nor be returned immediately by the veins, but sticking there in the passage it is accumulated more and more, and being at length extravasated, and filling and stopping all the Pores of the contiguous skin and flesh, it raises a tumour with redness, and heat most intense, which coming to pass, either the blood so heaped up, and extravasated, in a short space of time becomes immovable by reason of constipation, and for that cause being as it were divided from the rest of the mass, it is extinguished; and suffering death produces a Sphacela upon the part: Or secondly, the blood so stagnating, is after a sort agitated as to its particles, and enjoying always a vital flame, and made more intense by the same, it is as it were boyled throughly, and so is changed into a Pus, to be evacuated by an abscess: Or thirdly, which happens more frequently, and ought always to be procured in our case, the blood provoking an inflammation is reduced into the Vessels and restored to Circulation by other passages whereunto it is constrained.

But that it may be reduced, these two things will be necessarily requisite: First, That it be much diluted with the Serum flowing thither abundantly, or rather thrust forward into the part: Then secondly, that the Vessels behind the Tumour being emptied, may swallow up the blood diluted, and driven back by the Serum; for the blood being forced towards the Tumour, when as it cannot advance forward, yet its bulk being diminished; that it may be able to return back, it discharges the Serum plentifully from it self, and drives it forwards into the places obstructed; which entering under the stagnating blood, dilutes it, and succeeding into its places, forces it back into the passages of the Vessels, and in the mean while that Serum tending forward exhales by the pores; inasmuch that the blood which was extravasated being diluted and forced back by the Serum, and the Serum it self evaporated, the swelling with the Inflammation vanishes leisurely away. But if (as in more hot temperaments it comes often to pass) the blood being extravasated and impacted in the pores, be not diluted by the Serum brought to it in great plenty, it will not only stick there pertinaciously, but it will irritate a fiercer Phlogosie with a Fever, and sometimes other dreadful symptoms. So, not long ago, when a renowned Divine, endowed with a thicker and hot blood, had an Issue cut in the inside of his Leg, although the skin only was cut, an inflammation followed presently, which within few days so cruelly encreased, that it could hardly be impeded by any Remedies from degenerating into a Gangrene. Wherefore, when the blood being extravasated through the solution of the Union, and wanting the afflux of the Serum whereby it may be diluted and brought back, proceeds into an Inflammation, Fomentations and Cataplasms of Emollients being outwardly administered, do often-times bring help; inasmuch as the moist and soft particles falling from these, go under the blood stagnating, and dilute it, and so pleasantly moving it together, cause it to return the more easily into the Vessels; hence it is, that the moist applications of this kind being administered outwardly, do supply the defect of the intern Serum requisite to dilute the blood; notwithstanding that the blood being so diluted and irritated into motion, might be rendered fit for its Circulation, there is also need that the Vessels which should receive it should be enough emptied, for which purpose Phlebotomy and Purgation are frequently of necessary use, besides a slender Diet. And indeed according to usual custom, we purge Cacochymicks or Plethoricks a little before, or after the Issue is made, and frequently breath a vein in those Patients. Neither are these Remedies only fit

P H A R
Part. II.

What chiefly requires help.

1. Inflammation.

Which happens to a new Issue, the reason of it and Cure proposed.

An Inflammation hath three manner of Crisises.

The ordinary and best of these is, that the extravasated blood may be reduced.

How it is done.

What Remedies there is need of.

For this end oftentimes purging and bleeding are required.

P H A R. in an Issue made, to provide against or discharge an Inflammation, but also they are advantageous as often as that distemper ensues upon an old Orifice of the skin. For as often as the blood being very impure, and together growing feaverishly hot, doth enter into a separating turgescence, it frequently happens that it discharges its recrements and feculencies, otherwise unapt to be purged out, about the Fontinel, and there being impeded in its Circuit by them accumulated together, it is extravasated, and for that cause brings on a fierce Phlogosis. Such an affection not long since happening in a renowned ancient person, and being neglected from its commencing, within a short space of time degenerated into a Gangrene; notwithstanding from which by the help of appropriated remedies carefully exhibited, as well inward as outward, he escaped not without great danger of life. At some other time hereafter perhaps, when treating of Cutaneous diseases, we will speak more largely of the Ætiologies and Remedies of an Inflammation, and of an Abscess or Impostumation and Spachela. At the present we will consider the other Symptomes of Fontinels.

An Inflammation sometimes happens to old Issues.

2. An Issue pouring out too much and stinking Ichor requires remedy.

Of which there are two Intentions.

First, that the Temperament of the blood be restored.

Secondly, to preserve the tone of the part ulcerated.

Thirdly, a dry and troublesome Issue requires help.

An Issue sometimes will heal up notwithstanding all endeavours to the contrary.

Sometimes it hath spongy flesh growing about the lips.

2. Whenever an Issue throws out too much Ichor, which for the most part is thin and very stinking, and sometimes discoloured, so that the so vast loss of humour, and that stinking, not to be endured, do require a Remedy; in such a case there will be two chief Therapeutick Intentions, viz. First, that the mixture of blood be strengthened, lest its consistence should be too prone to dissolution and serous efflux: Secondly, That the tone of the place ulcerated by the Fontinel be preserved, and rendered exempt from any putredinal ferment, so that no taint being there lodged in secret, do impart any pollution on the blood passing through in Circulation, whereby it being infected, might presently go into parts, and the Serum be constrained there to discharge it self more abundantly.

This former scope of Curing enjoyns scarce any thing but moderate purging by intermission, and a regular Course of Diet, viz. that the Patient be restrained from all surfeit and excess, as to the plenty of Nourishment, the quality, and seasons of receiving it; likewise more especially from small Wines, Cider and other acid liquors, whereby the blood is wont to be dissolved into effluxes. For indeed those that are so affected, do smartly pay for any error or irregularity in Diet, pain being immediately irritated about the Issue.

For due preservation of the tone of the place where the Issue is made, and exempting it from putrefaction, let sedulous care be endeavoured, that all nastiness be declined, that both the solid things put into the orifice, as also the Coverings, whether Plaisters or Leaves of Ivy, or Oyl cloaths, be changed twice every day; for in some persons any of these will quickly contract a stench, and presently cause the Ulcer of the Issue to putrifie. But if this tends to putrefaction, immediately in place of a Pease or wooden Pill, let a Pill of Virgins Wax be put in, incorporated with red Sanders and Verdigrease: Moreover, let a Fomentation withal, Morning and Evening, with the Decoction of St. John's-Wort, Yarrow, Centaury, &c. be made use of.

3. Sometimes a Fontinel like a dry Fountain pours out little or no humour; the reason whereof is usually, either for that the orifice being not deep enough, doth not penetrate the whole skin, which is cured by piercing it deeper; or the Ulcer though hollow and large enough, yet remains always dry, because the Serum doth not easily nor in plenty separate from the mass of blood, by reason of its consistence being too much bound up; and then the only remedy is, to wear solid things within the Orifice, which may more provoke or twitch the mouths of the Vessels, for which purpose Pease made of Ivy-wood, or Box, or of the roots of Gentian or Hermodactyls, are often used with success.

4. It often happens, that the Orifice of an Issue being too shallow, and sparingly sweating out Ichor, is grown over with a thin skin with the Pease included therein, and the deep hole is healed up quite; for which fault there is scarce an apt remedy to be administred. Wherefore it is better to close that Issue (rather than always in vain to fret the skin) or transfer it to some other place.

5. The sore of an Issue tending to healing, and being forbidden, often procures a spongy flesh about the edges, and sometimes in the hollowness it self; the reason whereof is, because the nutritious liquor being conveyed to the ends of the Arteries and nervous fibres, and being not immediately washed away by the serous Ichor, fixes there, and beginning to be assimilated stretches out both these vessels to fill the cavity with flesh, and into these rudiments of flesh both the blood and Animal spirits flow most copiously; and the blood in the mean time being conveyed thither, forms sprigs of veins within that bulk for its return. Notwithstanding this flesh as yet rude and without shape, being excluded for the most part from the hole, grows up over the edge; and when in this manner it rises higher than that it may possibly be covered

covered and cloathed with skin and Cuticula, it remains always naked and spongy. PHAR.
This excrescency is easily enough cured by sprinkling thereon Escharotick powders, Part II.
of burnt Alum, Colcothar, or Mercury precipitate; for remedies of this kind do
eat away the flesh so luxuriating by their acrimony as well as stiptickness, repel the
nutritious humour, and lock up the mouths of the Vessels. As often as that super-
fluuous flesh encreases about the sides of the Issue, it is a sign that the nutritious hu-
mour flows thither more plentifully than the excrementitious; and for that cause in Pa-
tients so affected that vent proves not always so benign. Wherefore, under pretext
of this reason many are averse to that remedy (though surely it is harmless to most,
although not alike useful and advantageous to all.) We have before considered the
chief disadvantages thereof, as likewise the scandals objected thereunto; yet there
remains another thing according to the opinion or rather error of the Vulgar, a notable
objection against Issues, which we will here discuss for a Conclusion.

With many in England a contumacious opinion is grown up (I know not whether
it be so in other Countreys) That one or more Fontinels dispose to barrenness. Where-
fore this kind of remedy, however otherwise conducible to health, is scrupulously
forbidden to all married Women that desire Children; of which Prohibition there
is no reason as yet made out, but only Stories related of certain Women that have
been barren having Issues; when it were as easie to enumerate more barren women
without Issues, and many others that have been fruitful with them: and truly I use
to retort (whenas there is no need of any other refuting) this as a chief Argument a-
gainst that opinion.

SECT. III. CHAP. V.

Of the Diseases of the Skin, and of their Remedies.

After Attractive Remedies of the *Cuticula* and Skin, namely Issues and blister-
ing Medicines delivered before, by a certain Law of Method we are in-
duced to handle Diseases of those parts; and other kinds of Remedies of divers
sorts the true *Ætiology* of which will afford matter of most pleasant as well as profitable
speculation.

As for the fabrick and uses of those parts, it needs not that I should here repeat
all things already accurately described, and well known in Books of Anatomy. It may
suffice us to note concerning the *Cuticula*, that this outward skin is thin, and dense,
without blood and without sense, as destitute of Vessels and Fibres, which cleaving
to the inward skin, covers and defends it from outward injuries. This is every where
full of pores, into what orifices the Vessels discharging sweat do open, which *Malpighius*
viewing more accurately with a Microscope, a little before their gaping or opening, af-
firms to be endued with little Valves, for the retaining or free breathing forth of sweat:
but I confess they lye hid to me.

The *Cuticula* being taken away by Fire, or Phænigmons, the skin appears naked,
and looks red by reason of the sanguiferous vessels. But this is a thicker membrane,
as to its greatest parts, formed of filaments of Vessels bringing blood, of Nerves, and
of nervous Fibres, variously interwoven and complicated among themselves, among
which numerous Glandules and Lymphaducts, or Vessels discharging Sweat and Va-
pours, are thickly interposed. The substance hereof is related to be double by most
Anatomists, the outer is nervous, the inner fleshy, or rather glandulous; for an ex-
ample of which the Rind of an Orange is brought. If the skin be viewed naked
by a Microscope, by the renowned *Malpighius's* observations, First there presents
it self a body in form of a Net, in whose thick holes are contained not only passages
of Sweat, but also very many Teats in form of a Pyramid, rising out of the skin in pa-
rallel ranks, and passing into the *Cuticula*, where being stretcht out in length, they are
divided as it were into many little Fibres; which the same Author hath determin'd to
be the sense of touching. Besides these, the substance of the skin contains very many
Glandules, by which means the Lympha or watery matter is carried by the Lym-
phaducts or excretory Vessels, out of the Arteries to the Pores. For indeed the most
accurate *Stenon* hath observed, that its Glandules lye under every pore; which become
either greater or lesser, according to the use of sweating: the sweat or vapours
continually

P H A R.
Part. II.*The Pores twofold, greater and lesser.**The wrinkles and furrows of the Skin.**From whence the Roughness or Fineness of the skin.**Depends much on the Humours filling the Pores.**From the sudden shutting up of the pores.**In the larger pores are the roots of the hairs.**No Diseases of the Scarf-skin.**The cause of some.**The Cutaneous distempers reckoned up.**Distempers in the skin with or without a tumour.*

continually streaming out of these by the excretory vessels, avoiding the excrements, do moisten the nervous Teats in their passages, lest perchance they should grow dry. As to the pores or passages of Sweat they are discovered by a Microscope to be of two kinds, viz, The greater, in most of which the roots of the hairs are imbedded in a parallel rank: Or, secondly, they are the lesser Pores, which being numberless, do fill up all the spaces between the former in most thick Punctums or pricks. For indeed the whole skin with its wrinkles, appears like a Field furrowed by a Plow, and afterwards harrowed with the ranks turned, or rather oblique; so that its ground being eminent above the furrows of either kind, there remain in its plain, Figures very much of a Rhomboidal or a Diamond-fashion; and accordingly as those furrows, with their banks or flattes, are either shorter and less, or deeper and greater, the texture of the skin appears either delicate and thin, or thick and coarse. This kind of Constitution although it be most owing to ones birth, and to the primogenial growing together of the humours, is however manifoldly altered by reason of the various accidents of the ensuing life. A more gross Diet, difficult labour, injury of Air, and chiefly excess either of heat or cold, render a skin more rough: also contrariwise a nice and delicate education renders its tone more fine and soft.

That the skin may become more neat, smooth and equal, it avails much that all its pores be filled with a benign, mild and unctuous humour; for so, whilst all its pores become full and extended, the level of the whole skin appears more smooth: Notwithstanding if a vicious humour furnish those pores, or the benign humour that was in them be too much exhausted, for that cause the skin will become rough and full of wrinkles. Wherefore if any endowed with a most soft and even skin, shall wet their hands in a Soap Lather, Lie, or Lime-water, or also for some time in warm Blood, presently the furrows and wrinkles will grow greater and deeper, the saline humour being drawn out by the other Salts out of the pores; wherefore more delicate women scrupulously decline washing with Soap, or any other things that furrow the skin.

Neither only the humour being too much exhausted out of the pores, but also retained in the same either unduely or above measure, doth render the skin rough and unequal. The hairy pores (which though they are not the only, yet are much the passages of Sweat) do constantly send out more plentiful Effluvia's for the sake of transpiration, wherefore they ever seem greater and more open; but if it shall happen that these are suddenly obstructed by any outward cold, the Vapours being retrained within, they do every where swell up the skin about the places where they break out, and lift it up into little heaps: from hence if at any time our bodies are exposed naked to the Northern wind, or are plunged in a River, the exterior Superficies before smooth and soft, will become rough and rugged like the skin of a Goose new pull'd. Without doubt those greater pores, being, according to the furrows of the skin, planted parallel, and as it were in a rank after the manner of a *Quincunx* or exact Square, are made as so many pits for the planting of hairs as it were trees; for so they appear in four-footed Beasts, and in some hairy parts of men.

These things being thus briefly declared concerning the *Cuticula* and Skin, as touching their frame and uses, there is way enough made to search and unfold the Diseases of the same parts, and the reasons of healing them.

Wherefore first scarce any Diseases properly belong to the *Cuticula*, it being devoid of life and sense. This sometimes being too thick hinders Transpiration, and also sometimes by reason of accidents in some places it grows too thick and callous: but it self being clearly unsensible it is never sick, notwithstanding this is a cause that some distempers which might be blown off by Transpiration, do cleave to the Superficies of the skin, inasmuch as the dregs of the blood, and humours, and recrements being thrust forward outwards, having passed through the whole skin, when they cannot evaporate wholly by reason of the thickness of the Scarf-skin, being fastened in the outer skin, produce various discolourations, and stains thereof; of which sort are those spots called Heat-spots, Freckles, or Ephelides, as also scorbutical and malignant spots, also Pimples and whatsoever other stains without any swellings or roughness do seem to besprinkle the skin or outward Scarf-skin, with marks, or some little disfigurings.

But truly as to what belongs to the distempers of the Skin it self in general, since they are various and manifold, they are wont to be distinguished under a various respect, and chiefly that they are either with or without a Tumour; we have but now taken notice of these latter ones.

Distempers of the Skin with a Tumour, are either universal, dispersed throughout the whole body; or are particular, being raised in these or those members, dispersed or as it were by chance.

The

The former either happen upon a Feaver, as chiefly the Small-pox, Measles, or other malignant wheals, whereto also may be added the fleeting pushes of Infants; or happening without a Feaver, as the Itch, Tettors, and leprous distempers.

The outward particular Tumours, or dispersed ones, for the most part do not seize upon the skin only, but also upon the parts subjected, viz. now the carneous, another while the tendinous, or membranous or glandulous, and for that cause do exist of a sundry disposition, and of a diverse form. To discourse particularly concerning all these, and to assign the reasons of their Causes, and Cure of every one, would be a matter not only of an entire Tract, but of a great Volume: Wherefore, for the present we will only briefly speak of the Distempers merely or for the most part Cutaneous (of which sort are all Spots and Pimples, as also the Scab, or Itch, Tettors, or leprous Maladies:) perhaps, an opportunity may happen, when I may treat more specially of Tumours of every kind.

First then (that we may begin with Spots as Affections of lesser moment) those offer themselves called *Ephelides*; because they are chiefly caused from the Sun's heat; for that cause frequent in the Spring, and increase most in Summer, again in Winter they soon vanish. Moreover, whereas they happen in the more beautiful persons, and of a thinner skin, they break out chiefly in those places where the *Cuticula* is most thick, and is exposed to the Sun and Air, viz. the face and hands, of a colour yellowish or brown, in magnitude of a Flea-bite, but they exist unequal and irregular as to their Figure. These differ little or nothing from those brownish or yellowish spots which some call *Lentigines* or *Freckles*, which consisting of the bigness of a Lentil, mark the parts of the face as it were with many drops.

1. Spots call'd
Ephelides.

The description
of the *Ephelides*.

The matter of these seems to be a more thin portion of the cholerick humour, allured outwards by the force of the Sun attenuating it, and opening the pores of the skin; which beginning to be evaporated, is fixt to the inside of the outmost skin or *Cuticula*, which it cannot pass through. Surely it is a sign these spots proceed from Choler, or other yellow scums of the blood, because they are chiefly familiar to them whose hair is yellow. Moreover, the reason is manifest enough, because they arise more often in a fair Complexion, and in those parts exposed to the Sun and Air; for their more thin skin transmits the humour rarified by the solar heat so far until it is retained by the thicker Scarf-skin, near the places of issuing out. This affection presages or indicates no evil, as to the state of health; and although in appearance it represents something of deformity, notwithstanding that is made good again, in so much that it signifies them so spotted, to be endued with a more pure Constitution.

The matter and
cause thereof.

Besides these small freckly spots there are others much larger, above a hand's breadth in magnitude, which deform the skin in divers places, especially about the breast and back, one while with brown, another while with pale or blackish spots. These at certain times, as I have observed in many, being wont to arise in certain parts and vanish again, are commonly called *Liver-spots*, and those most mark with them are thought to have a *Liver* less sound, or at least not well sanguifying; which notwithstanding is not true on this account, but only inasmuch as the cholerick humours, when they are not enough separated from the mass of blood within the *Liver*, being thrust forward to the skin do so discolour it: which fault also is imputed to the *Spleen*; for truly this deformity arises, because that the feculencies and excrements of the blood, when not enough received by the Vessels of separation; are together diluted with the Serum, with which they are conveyed to the skin, and in the same place being cast off by the blood, and deserted by the serous Juice while it is evaporating, they are fastened about the outer little holes or pores, even as a mossie down cleaving to the strait places of a River.

Lenticular
Spots.

Liver Spots
falsely so called.

These spots chiefly appear in Summer, and most upon the Breast and Back, viz. at which time and in those places men are most apt to sweat: for that serous Juice which brought out those dregs from the mass of blood, into the strait places of the skin, leaves them there, altogether unable to evaporate. This indisposition hath nothing of evil joyned to it, nor is it a symptom of any present disease, nor doth it presage any suddenly approaching; Moreover, when for the most part it happens to places that are covered, and brings no deformity or trouble, there seems little or no need of Cure: but because an opinion is frequent with the Vulgar, that the *Liver* is eminently endangered by these spots, and necessarily requires Medicine, for this cause to satisfy the importunate, craving Medicines, we are wont to prescribe, besides extern Cosmeticks, even inward hepatic Remedies; whose use although not very necessary, yet because from thence the depuration of blood, and opening obstructions of the bowels are dispatched, they are not altogether in vain. The inward Medicines profitable to this design,

The description
and cause of
them.

P H A R. sign, are described before among the hepatical Remedies : The Topical or outward Part. II. are altogether the same in these as in any other kind of spots ; some select forms of which we will annex.

Pestilential and scorbutick spots.

Concerning Pestilential, as also Scorbutical spots, of which we have purposely in another place spoken, there is no need here to repeat the same ; especially because for these another method is required, than for those but now described ; inasmuch that in one kind of spots, Medicines for the most part outward are wont to be administered, without Splanchnic or Cordial medicines, but in the other kinds only inward medicines, without any that have reference to the Skin.

The Cure of the Spots.

Wherefore, as to the spots called Freckles, Lentigines, and those commonly called Hepatical, they properly belong to the Art of Beautifying ; and for the taking away these Deformities, of the Skin, only Cosmetick Remedies are prescribed, without any method of healing. There is every where a plentiful harvest of these with curious Ladies, and others, that are solicitous of cleansing their skins ; yet all these, forasmuch as they only respect two Intentions of healing, may be reduced to these two heads ; viz. either by opening the pores of the skin and Scarf-skin, and sometimes by excoriating this, they do endeavour to have the humour drawn outward, and also to be evaporated ; or on the other side, and not with less success, those things are administered that may drive back the spotty matter, and force it inward. We will annex here in order some usual Forms of the Topicks of either sort, being rationally found out, and frequently made use of happily enough ; because it is not lawful without offence of the Great Ones to detect the more secret mysteries of the Cosmetick Art, and to profane it among the Vulgar.

Forms of Cosmeticks.

1. Which cleanse the skin.

First therefore for cleansing the skin, and drawing forth the matter of Spots :

Take of a small ly of Salt of Tartar four ounces, Oyl of bitter Almonds made by expression, as much as suffices, in such a proportion let it be mingled, that the liquor turn presently white, and so remain ; with this mixture let the parts be anointed morning and evening, and gently chafed.

Take of Aron-roots, Bryony, Solomonis-Seal, of each one ounce, Powder of Fennigreek-seeds one dram, of Camphir half a dram, these being beat together, pour on them three ounces of Oyl of Tartar per deliquium, let it be pressed and applied with a rag twice aday.

Take of quick Brimstone in powder one ounce, black Soap two ounces, rye them in a rag, and hang them in a pint of Vinegar for nine dayes ; after let it be used by washing the part twice aday, and chafing it.

2. Which repell the spotty matter.

Lac Virginis.

Secondly, for the other intention of discharging the spots from the skin, and repelling their matter inwards, Lac Virginis was a renowned Remedy among the Ancients, and is as yet commended and made use of by many : The Preparations are well enough known, Viz. A Solution of Litharge made in distilled Vinegar, by pouring of Oyl of Tartar per deliquium, it is precipitated into a white liquor like milk, with which let the face and hands be washed twice aday, and gently chaf'd. A remedy like this or of the same vertue is prepared out of the solution of red Lead or Ceruse made in the same Menstruum, and precipitated with Alum Water, or a Solution of Sal Gem. Or,

Take of Camphir sliced two drams bruised in a glass Mortar, pour thereon leisurely the juice of one Lemmon, then add one pint of White-wine, strain it, and let the remaining Camphir tyed in a rag be hung in the Glass.

Take Verdigrise four Ounces, pour thereon two pints of White-wine Vinegar, being put into a Cucurbite-glass, let them be distilled in Sand, let the Phlegme be kept for use, with which let the face be anointed twice aday.

For this purpose also the Phlegm of Vitriol doth notably conduce. It suffices some to use the distilled simple water of Bean-flowers, or of Fumitory, or the liquor of a Vine distilling from the Boughs cut in the Spring-time. Notwithstanding the more nice, and those who chiefly boast to understand this Art, are scarce content with any Remedies but Mercurial, wherefore the following water is commended and sold by Empiricks at a great rate against all foulness of the face whatsoever.

A Mercurial Cosmetick water.

Take of Mercury sublimated one ounce powdered, put it in a Tin Vessel with three pints of Spring-water, let them stand twenty four hours space, ever and anon stirring it with a wooden Spatula until the whole liquor grows black, which notwithstanding being philter'd through brown Paper, becomes clear ; with a rag or a feather dip in this, let the face be gently done over once or twice in aday. This

This Remedy doth moſt notably help againſt all cutaneous Deformities, viz. inas-
much as it drives away the humours within the little pores, and thoſe impacted with-
in the little holes howſoever ſmall, diſſolves the inveterate and ſtubborn combinati-
on of Salts or Sulphurs, and reſtores the whole ſkin, (where it is applied) though
evilly framed as to its pores, and makes it well coloured. Wherefore it is uſeful not
only to cleanſe the ſpots of the face, but alſo to take away wheals and its redneſs, as
alſo the Diſeaſe of the Eriſypelas. Moreover, ſometimes it happens that many parts
of the face, eſpecially the Noſe and Forehead, are markt with moſt thick Specks look-
ing black, as if burnt by Gun-powder, which proceeds from hence, becauſe the ſudato-
ry pores are ſometimes fill'd with a more thick black humour, another while with lit-
tle worms with black heads (which little Inſects being ſqueezed out of the pores, and
expoſed to the Sun, are eaſily ſeen to live, and to move themſelves) and in ſuch a
malady of the ſkin, no Lotion or Oyntments are wont to profit, but what are Mercuri-
al; notwithstanding to this Hony there is a Thorn at hand more than enough ma-
lignant. For the particles of the Mercury together with its Salts (by which they are
divided and ſharpened into ſmall bits) being applied to the face, do ſhake off the pec-
cant and uncleanly matter out of the Pores, and expel it thence, but having driven it
back, they purſue it in, and readily inſinuate with the Blood and nervous Liquor,
whoſe temperaments they prejudice. Yea by meeting with theſe they imprint very of-
ten on the Brain and ſometimes on the Præcordia and other parts, their virulency that
can never be wiped out. From hence it is frequently obſerved, that women or men
that have long uſed Mercurial Coſmeticks, are troubled with a Vertigo, and convul-
ſive Diſtempers, or are obnoxious to paralytical, and their Teeth grow black, and
ſometimes fall out.

PH A R.
Part. II.

Its Vertue.

Its familiar
uſe is not ſafe.

SECT. III. CHAP. VI.

Of the Mange or Scab with the Itch.

After the more ſimple maladies of the ſkin, viz. thoſe which happen without
any Tumour and Ulceration, and only deform it with ſpotted appearances, *Pſora a diſeaſe
properly cuta-
neous.*
we will now in order treat of the more grievous Affections, and thoſe which
diſſolve the Unity, and eſpecially of the Pſora or Scab, which in ſundry and frequent
places of the whole Body doth much infeſt the ſkin with a painful Itch, and with
ſmall puſtles and breakings out, being ſometimes dry and often ſcaly, and another
while moiſt and diſpoſed to ulceration; and a malady of this ſort is moſt properly the
Diſeaſe of that part, conſidering it frequently begins in the very ſkin by reaſon of
ſome outward Contagion, and often receives Cure by certain Remedies applied to
the ſkin only, at leaſt the reaſon of both holds ſo far, that it is ſeldom otherwiſe un-
dertook or perfectly cured.

The Pſora or Scab is vulgarly deſcribed to be a breaking out of Puſtules and wheals *Its deſcription*
throughout the whole body, here and there, procured from a ſharp and ſalt humour
heaped up in the Pores of the ſkin, and that it may be diſcuſſed from thence indu-
ces a notable Itch, and a neceſſity of ſcratching.

That we may ſearch duly into the cauſes of this Diſeaſe, and the reaſon of the
ſymptoms, we will more deeply enquire concerning the matter effecting and the con-
junct cauſe thereof, that it may certainly be known of what ſort that humour is
which is heaped up within the ſkin, by what means it is either generated there, or
comes from ſome other parts, afterwards in what pores or little places it is contained,
and how endeavouring to break out, it doth create ſo troubleſom an Itch.

Wherefore about the origine of this Diſeaſe, that we may not impute the fault *What humour
its matter is of.*
with the Ancients to the Liver or Spleen, the matter thereof is not any particular
humour of the four commonly ſuppoſed ones, nor Phlegme, nor yellow Choler, nor
black, neither only the blood apt of it ſelf to be extravafated; moreover neither doth
it ſeem to conſiſt of two or more of theſe humours mixt together. For though ſuch
humours be granted, notwithstanding if this Diſeaſe always conſiſts of them, it would
not ſo eaſily be catch'd by a meer and light contagion, or receive Cure by an Oynt-
ment alone. Wherefore it is rather to be ſuppoſed, that the morbiſic matter is the
humour of the Lympha conſtantly reſting in the glandules of the ſkin; notwithstanding
degenerating

Not any of the
four common
humours.

But a humour
plac'd in the
Glandules of
the ſkin.

P H A R.
Part. II.

degenerating from its genuine disposition, that is to say, its volatile salt, into an acid or otherwise offending disposition. For when the continual Supplements from the blood come to this so depraved, and uncessantly evaporating, these Juices new and old do not easily agree, or are united, but boiling together after the mutual custom of dissimilar Salts, they are coagulated into a recrementitious matter, which filling and distending the pores of the skin, every where raises it into Tumours; Moreover it something hinders the Blood in its passage, and constrains it to be extravasated. From hence thick Pustules are raised, and because that matter passing into an Ichor is compelled by the Serum and Blood pursuing it still forward, they rise up into little heaps; afterwards the Animal Spirits entering inordinately into the nervous Fibres, that they may promote the throwing off that Ichor, do cause the sense of that troublesome itch.

*The description
of that Juice or
Humour.*

Indeed an inspection with a Microscope doth most clearly discover that there is a lymphous humour in the glandules of the skin which lye under all the sweating pores, treasured up for some uses, so that according to the plenty and diverse stay thereof, these Glandules exist more or less turgid. This Juice is laid aside by the Blood, through the Arteries, in these Glandules, that this little burthen being cast off, it might return more easily through the veins; in the mean time being reposed there, it hath its uses, viz. In the first place continually moistening the miliarie Teats, which lying under the nervous little Fibres, are the proper Sensory of Touching, it preserves them from dryness, which would hinder the Sense; also it imbues the adust effluvia's passing uncessantly from the blood being kindled, in their passage near the skin, with a certain moisture, and renders them fit to be voided by the pores; and whilest part of this humour doth so continually evaporate with the Effluvia of the blood, those expenses are repaired by the Lympha continually fresh, being deposited by the Arterial blood as is abovesaid.

*How it dege-
nerates.*

Notwithstanding this oeconomy of the Region of the skin is not always so regularly kept, but that the glandulous humour falling from its own disposition and function, not only will provoke in the skin, but sometimes in the whole body, preternatural affections of divers sorts. This growing clammy, and cleaving more obstinately in the little Cells obstructs transpiration; and immoderate sweating proceeds from its too plentifully flowing out, and from the same restagnating inwards, a more than usual Diuresis. Moreover, as to what belongs to the Scab and pustulous eruptions, that humour as it is wont to be depraved many ways, so chiefly these three, and is wont to enter into a coagulative disposition with the Serum, being fresh poured out from the blood, viz. First the Blood it self being very impure, and also dissolved, it leaves its corruptions and superfluous dross in the cutaneous Glandules, which in the same place putting on the nature of more corrupted ferment, they boyl up with other adventitious Juices, or passing by these, and are diversly thickened, and so they beget not only pustulous affections, but also leprous of divers kinds. From hence the daily and often eating of Shell-fish, and also of others; and of salted meats that have been hung in the Sun or Smoak; also the taking disagreeing Drinks, and venomous Medicines, do cause cutaneous and frequently dreadful eruptions.

*This is done
three ways.*

1. By reason of
impure Blood.

Secondly, The humour being heaped within the cutaneous Glandules, sometimes doth not only become pustulous by a mere stagnation, but also frequently Louie. Wherefore, not only they that have been long in prison, but also those who being of a sedentary life, are used to nastiness and sluttishness, do live obnoxious to the abovementioned maladies; inasmuch as the cutaneous humour being not at all eventilated, is corrupted by mere standing, after the manner of putrefying water, and so it puts on the disposition of a corrupting ferment; to which moreover Supplements of putrefaction come from the blood in the like manner depraved.

2. By mere
stagnation.

3. By Conta-
gion received
from without.

Thirdly, If perhaps these Causes are wanting, that the glandulous humour of the skin, neither contracts any stain from fault of the blood, nor its own proper stagnation, notwithstanding virulent steams communicated from without, render it no less prolific as to those diseases. This is manifest by common observation especially, forasmuch as they that have health most, and are endowed with the best Constitutions, scarce ever escape free from the same, if they lye in the same Bed either with a scabby person, or where he hath lately lain: and not only so, but moreover the Linnen of the Scabby, oftentimes washed with other Linnen have bestowed the contagion upon others. Surely, the taint of no disease (the Plague only excepted) is more easily or certainly propagated than this of the Mange.

*The reason of its
most sudden con-
tagion is un-
folded.*

If the reason of this be enquired into, we presently say that the liquor susceptible of the scabby taint is mightily exposed, and most easily disposed unto it; and indeed much more ready to either, than the Blood or Nervous Juice. For the glandulous humour

humour of the skin abounding in the outer ſuperficies of the body, firſt imbibes every Atome let in by holes and pores every where open, and anticipates them from the blood. Moreover, that this is ſo ſoon infected with a ſcabby Contagion, both the activity of the ferment communicated cauſes it, and alſo the proneneſs of the glandulous liquor to degenerate. For indeed the effluvia's falling from the breaking out of the ſcabby ſkin, are aptly enough compared to the Yeſt of Ale, remaining on the top as it were its outmoſt Coat; of which if the leaſt portion be taken from thence, and mixed with other new Ale unfermented, preſently it ferments the whole maſs how great ſoever, and changes it into the diſpoſition of the liquor from whence it was taken. Certainly there is a very conſiderable energy, which the particles however ſo ſmall and little, carried to the higheſt activity, are able to perform; but eſpecially if they fall into a liquor (of which ſort is the cutaneous) made up together of ſubtile particles of the ſeveral ſorts, as well partaking of the blood, as of the nervous Juice, and for that cauſe moſt readily apt to be fermented. Whereſoever therefore theſe effluvia's of the Contagion abovesaid hit againſt any outward part of a healthful body, firſt they will infect the cutaneous humour only planted in that place, but then the particles of this ſo corrupted, being received by the venous blood, and preſently delivered to the Arteries, are diffuſed through the entire habit of the body, and in a ſhort time defile the whole maſs of this Humour and make it ſcabby.

P H A R.
Part. II.

The Contagion when any where received, preſently ſpreads over the whole ſkin.

From theſe Cauſes of a Pſora as well adjunct as procuring being unfolded, the reaſon of the firſt ſymptoms, or breaking out in Puſtules, is manifeſt enough; but as to the other, viz. the Itch, as it is troubleſome to Senſe, that the formal reaſon thereof may be known, we ought to conſider to what Senſory or Organ of ſenſe it properly belongs, and of what ſort its paſſion or affection ſhould be.

Concerning theſe things, firſt it is ſure it belongs to the ſenſe of touching, and that the firſt Inſtruments hereof are Teats ſhaped like a Millet, and their little Fibres diſperſed through the whole ſkin, as we have before declared. Moreover with this ſenſe all the nervous fibres are endowed, being diffuſed throughout the whole body.

Of the Itch.

It belongs to the Senſe of Feeling.

Notwithſtanding, whereas there are two ſupream paſſions of Touching, and as it were generical, viz. Pain and Pleaſure, it is deſervedly doubted to which of theſe Itching ought to be related. For the ſolution of which, we ought to ſhew by what means the Animal Spirits, being inmates to the organ of Touch, are affected in Pain, and alſo after what manner in Pleaſure; then their demeanour alſo as to the Itching being deſign'd, it will eaſily be manifeſt of what Province this Paſſion is, and in what things the nature of it, and the manner of its acting do. conſiſt. Let the Reader pardon me, if I ſhould by way of digreſſion expound this more at large; and even to tediousneſs, becauſe this ſetiology ſeems very neceſſary both to the underſtanding and curing of moſt outward diſtempers. Pain being diſtinct from Sadneſs and belonging to the Touch, is uſed to be defined, *A troubleſome feeling proceeding from the diſſolution of Unity.* And indeed it takes its origine as often, and in as much as any ſenſible thing, diſagreeable or improporionate, being applyed to that Organ of ſenſe, divides and ſeparates the fibres one from the other; and for that cauſe repelling the animal ſpirits inhabiting in them, from their wonted and quiet emanation diſtracts them from one another, and as it were puts them to flight; then preſently forasmuch as that outward repulſe of the ſpirits, is communicated by a continued order of other ſpirits, to the firſt Organ of Senſe, it ſtirrs up the Spirits dwelling there into the like confuſions, ſo a perception is cauſed of grief or pain inflicted outwardly. In truth the whole ſeries of animal ſpirits which are affected with pain, as it were ſome ſingular member of the ſenſitive Soul, conceiving trouble, as it were from the impreſſion of the object, is forced to be wrinkled with pain, and to contract it ſelf into a leſſer diſſenſion.

Of what ſort its Affection is.

The chief Affections of feeling are Pain and Pleaſure.

The formal reaſon of Pain.

When a diſſolution of Unity is ſaid to be the cauſe of pain, we muſt not underſtand it ſo as if this affection only were cauſed from a wound or blow inflicted upon the body, for the ſame thing is uſed to be induced from cold, heat, wind, from the extravafating of the blood and of other humours, or their being heaped up together in ſeveral places, oftentimes the ſhaping of the member remaining as yet intire; in which caſes, although the continued parts, and chiefly the fibres and filaments, are not all cut off, notwithstanding they are in every Affection of grief pulled from their uſual poſition, either by the oppreſſion of the object, or by ſtrange particles forced like wedges, and are compelled into too much tenſion or diſtortion, or divulſion; and for that cauſe the inmate ſpirits being pulled from their mutual embraces, and diſſipated, are ill at eaſe, and incur the paſſion of pain or grief.

The Solution of the Unity alſo, may be the cauſe of it.

Pleaſure

PH A R.
Part. II.

What Pleasure
is.

Its formal Reason.

It chiefly consists in removing of Pain.

What the Itch is.

How the Spirits
are moved in
it.

A certain medium between
Pain and Pleasure.

The difference of
the Pfora as to
its origine.

2. As to its
form.

The Prognosticks
of it.

Most dangerous
to Children and
ill juiced or
cachectick persons.

Pleasure is opposed to Pain, and is a manner of Feeling clearly contrary thereto; which takes its origine, inasmuch as a pleasant stroaking being made upon the Organ of Sense, the Spirits flock thither, and presently being thickly gathered together, and overspread with a certain delight, they do as it were exult and rejoyce together in the Organ: afterwards, inasmuch as the spirits enter into the like triumph or rejoycing within the *Corpus striatum*, a perception of pleasure is stirred up. The greatest pleasure which is offered to the Touch, consists in this, that the cause of Pain being removed, the parts formerly affected by it, may recover their wonted temper and frame; for so the animal spirits being before put to flight, and dispersed from one another, they recollect themselves, and rushing into the places from which they were banished with reinforced strength, they prepare themselves to rejoyce. From hence the Peripatericks placed the formal reason of Pleasure only in the removal of something that was troublesome, as when the excess of cold or heat is received by an opposite and more agreeable state. Indeed the tangible object (because it is always thick and dull) doth scarce any way else (excepting Venerie) allure the animal spirits into heaps to the Organ of Sense, unless for that it removes their former confusion.

From these things so described concerning those passions, it is easily manifest, that the Itch according to the formal account thereof, is neither perfectly nor fully either Pain or Pleasure, but imperfectly and as beginning, partakes of both. For really the scabby matter being heaped up within the pores of the skin, and making the solution of Unity in many places, enclines towards pain: yet as it is volatile, moving, and hastens towards vent, for that cause the Animal spirits are not put to flight from the Fibres although pulled asunder, neither are they driven back with sense of pain; but the contrary, as if being stronger than the humour infesting, they were able to cast it forth, they being wrapp'd up more thick, but irregularly within the cutaneous fibres, dotwiltch them together variously, and draw them on, that they may the sooner discharge the morbid matter, and expell it forth. Wherefore inasmuch as the Animal Spirits being neither put to flight, nor repulsed, but flowing together in crouds into the organs of Touching, they manage themselves there tumultuously, and disorderly, and as it were by tickling the sensible fibres do provoke them into small Convulsions, no pleasure, but a troublesome feeling, nor also is it Pain, but a Passion clearly diverse arises from it. But as soon as by rubbing or scratching, the plenty of Spirits assembled about the Organ of Sense, begin to be better disposed, and as it were reduced into order, from thence a thorough feeling of Pleasure is introduced. Wherefore the Itching seems to be a middle-state between the beginning of Pain and Pleasure, or a passage of the Spirits from the rudiments of that, towards the full compleating of this. But from this Physical discourse by the by, let us return to our Pathologie or discourse of the distemper. From what is above said it is easie to collect the differences of this disease.

In the first place therefore the Pfora as to its origine either is got by Contagion, or by reason of an ill Course of Diet, the fierceness and supply thereof is communicated by the Chyle and Blood being vitiated, or it is generated in the skin it self, by reason of filth, and the defect of Transpiration: Whereto we may add, that sometimes Infants acquire this taint hereditarily contracted from their Parents.

Secondly, These cutaneous Eruptions as to their form, vary according to the diverse Constitutions of the persons affected: for in some persons of a cholerick dryer Temperament, or Melancholy, only a dry Scab is stirred up, and inasmuch as it evaporates less by reason of the defect of the Serum, with an Itching not altogether so troublesome; but in others of a moister Temperament, and of more unclean blood, very many wheals and pustules imbued with Ichor, and most of all itching, do very much provoke to scratching, and by reason of the Ulcers stirred up therewith, the Itch is immediately altered into pain.

As to the Prognosticks, although this Disease is never of it self mortal or very dangerous, and always easie of Cure: yet frequently it contains an evil event; inasmuch as being long continued, it utterly depraves the blood and nervous Juice, and from it hastily cured, by reason of the matter received within, while it is discuss'd from the Pores, a pernicious taint is brought upon the Præcordia, and Brain, and other noble parts.

The greatest hazard from a Scab, threatens Children and Cachectick persons; as in both of which the taint is more easily impressed from this Cutaneous humour upon the nobler parts, which afterwards when the outward malady is removed, remaining within cannot be vanquished entirely, but a very long Course of Physick, of which neither is capable nor patient; wherefore, such persons, all care and diligence being

being adminiſtred, ought to be preſerved from the infection of the Scab as from the Plague. P H A R.
Part. II.

Concerning the Cure of a Scab or Pſora, two chief Indications preſent themſelves and each of them two-fold, viz. The firſt intention Curatory reſpects theſe two things, *Its Cure.*
Firſt, that the glandulous Humour (its corruptive ferment being wholly extinct) may be reduced to a due temper. Secondly, afterwards that the pores and paſſages of the ſkin being freed from thoſe Ichorous congealings, may recover their priſtine frame or good temper. *The firſt Indication curatory.*

The Second Indication Preſervatory takes care to prevent thoſe two things, viz. *The ſecond Indication preſervatory.*
Firſt, leſt the impurity of the Pſora, or corrupting Miasma's of the ſkin being diſcuſ'd from the ſkin (while the ferment is expugned) turn back again into the blood and nervous liquor, and bring upon them not only ill temperaments, but alſo (as frequently it uſes to do) a more conſiderable prejudice upon the Brain or Præcordia. Secondly, alſo let it be endeavour'd that the taint of the Humours, and of the noble parts contracted from the Itchy matter, may be eradicated while the faults of the ſkin are repaired.

All theſe intentions of Curing, by remedies internal as well as external together being much and often uſed, ought to be joyn'd together, or at leaſt-wiſe to be inter-uſ'd, viz. that the morbiſic matter being diſcuſſed from its reſeſſes, may not depart into and lye hid in any lurking-places any where elſe, but from every part, inwardly and outwardly, by remedies taken, may be wholly removed away; wherefore Pur-gatories ought alwayes to begin and end this method of Curing. Although *Helmont* with great pomp overthrows this Cathartick method of Phyſick, and as it were leads it in Triumph, becauſe it doth not cure the Scab by it ſelf, yet we may affirm this Diſeaſe without that remedy can ſcarce ever eaſily be cured, but never ſafely. More-over Phlebotomy, unleſs ſomething contradiſt it, is preſently to be celebrated in the beginning; upon theſe, Alteratives that cleanſe the blood and ſtrengthen the bowels, and defend againſt the aſſaults of the morbiſic matter, challenge their turns; and in the mean time Liniments, or Baths, or topical remedies of another kind, and properly Cutaneous, are adminiſtred: As without which not only Purging and Bleeding, but alſo Diaphoreticks, Diureticks, yea whatſoever remedies evacuating blood or humours, or altering them, become uſeleſs. We will annex ſome more ſelect ſhort forms of Medicaments, of every one of theſe Kinds but now recited. And firſt for the due undertaking of the Purging part, let there be adminiſtred in the beginning a purging Medicine or a Vomit; alſo after Phlebotomy being uſed (if need require) an Apozeme or purging Ale may be adminiſtred for ſeven or eight dayes. *Both inward and outward Medicines are to be taken together. Purges, Bleeding and Alteratives, and afterwards Toppicks are required.*

Take of Eleſtuary Diacarthamus three drams, Spec. Diaturbith with Rhubarb one dram, Forms of Pur-Cream of Tartar, Salt of Wormwood an. half a ſcruple, ſyrup of purging Apples what ſuf-fices, make a Bolus to be taken with Government. Or,

Take Sulphur of Antimony ſeven grains, Scammony ſulphurated eight grains, Cream of Tartar half a ſcruple, make a powder.

Take roots of Polypody of the Oak, ſharp pointed Dockſ prepared, an. one ounce, leaves of Senna ten drams, Turbith, Agarick, Epithymum, an. one ounce, Carthamus ſeeds half an ounce, Citrine Sanders two drams, Annife, Carue ſeeds, of each two drams, being ſliced, bruſed, &c. digeſt them warm in four pound of White-wine twenty four hours, pour it clear off without ſtraining: the Doſe ſix ounces by it ſelf, or with a ſpoonful of ſyrup of Epithymum.

Or take the foregoing Ingredients and boyl them in ſix pound of Spring-water to half, then add one pound of White-wine, and preſently ſtrain it for an Apozeme to be taken as the former. *Apozems.*

Take roots of Polypody of the Oak, ſharp-pointed Dockſ an. three ounces, Senna four ounces, Epithymum, Turbith, Mechoacan, of each two ounces, of yellow Sanders one ounce, Coriander ſeeds ſix drams, prepare them according to art, make a bag for four gallons of Ale; draw it after five or ſix dayes, take twelve ounces more or leſs every morning, for eight or ten dayes. *Medicated Ale.*

For ordinary Drink let a little four-gallon Veſſel be filled with ſmall Ale, wherein may be put the following Bag.

Take the tops of Tamaris, dried Fumitory an. four handfuls, roots of ſharp-pointed Dockſ dried ſix ounces, the rind of woody Night-ſhade two ounces, ſlice and bruſe them and mingle them. Or let them take a Bocher of the Decoction of Sarſaperilla, Saunders, with ſhavings of Ivory, Harts-horn, and Liquoriſh.

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*Altering Re-
medies.*

II: As to what belongs to altering Remedies, beside the Physick Ale for ordinary Drink, there seems not need of many others, but only, that a due government of Diet be observed, by declining Salt and Spiced Food, Shell-fish, and others seasoned with pickle; also abstinence from Wine, Strong-waters, stronger Ale, and from all Liquors apt too much to stir and ferment the blood. In a contumacious Pſora, and seizing upon a Cachectick body, it will be expedient to administer the following Electuary with a distilled water twice aday.

Electuary.

Take of Conserve of Fumitory, roots of sharp-pointed Docks, of each three ounces, Troches of Rhubarb, Species of Diatrion Santalon, of each one dram and a half, Salt of Wormwood one dram, Virriolum Martis four scruples, with a sufficient quantity of Syrup of Cichory with Rhubarb, make an Electuary, the dose from one dram to two, twice in a day, drinking upon it three ounces of the following water.

*A distilled wa-
ter.*

Take of the tops of Fir-tree, six handfuls, of leaves of Fumitory, Agrimony, Fluellin, Liverwort, Brooklime, of each four handfuls, roots of sharp-pointed Docks two pound, Bark of Elder two handfuls, the outward Rinds of six Oranges, cut them and bruise them, and then pour upon them eight pints of Posset-drink turn'd with middle-beer, distill them in a Rose-Still, let the whole Liquor be mingled together.

*Oyntments
whereof the
Basis is chiefly
Sulphur.*

III. Oyntments for to anoint the Skin, are wont commonly and efficaciously to be prescribed for the curing of the Scab; notwithstanding those which are administered to many other Tumours or Ulcers, do not help here at all; but Brimstone and Preparations thereof seem to have a specific vertue in this Disease, so that for the most part they are put into all Liniments for the Itch, and are the basis of the whole Composition. The Receipt chiefly used by the Vulgar is this.

Forms of them.

Take Powder or flower of Brimstone half an ounce, unsalted Butter four ounces, powder of Ginger half a dram, make an Oyntment.

A little more neat, though not much more efficacious is prescribed thus.

Take Oyntment of Roses four ounces, powder of Quick Brimstone half an ounce, Oyl of Tartar per deliquium what suffices, make an Oyntment: for scent sake add one scruple of Oyl of Rhodium.

*Other stronger
Medicines.*

When the force of the Brimstone is to be drawn forth or strengthened by other things added,

Take Oyntment of Enula-campane without Mercury four ounces, powder of Sulphur half an ounce, Oyl of Tartar per deliquium what suffices. For the same purpose the Oyntment of the roots of sharp pointed Docks boyled in Butter, or Oyl, with White-wine, to the consumption of the Wine, and made up with Sulphur and Oyl of Tartar. Also those Oyntments are used with success by themselves, the more curious abhorring the smell of Sulphur.

*The most power-
full made of
Mercury.*

But dangerous.

3. The third kind of Liniment against the Itch, is made of Mercury, wanting no guards of Sulphur, or any other Vegetables. But of it self it is too powerful to be applied all over the body, but only to the Joynts of the Arms and Thighs, or worn about the Loyns, made up in a Girdle, for so it seldom fails in curing the Itch. Notwithstanding there is danger lest this practice (as it often happens) produce evil and pernicious symptoms; for from the Mercurial Oyntment, frequently a salivation, also sometimes dimness of the eyes, or drowsie or convulsive Affections do proceed: Also sometimes the Poyson of the medicine within the Præcordia or Bowels produces the dreadful Affections of short breathing, Swounding, or bloody Fluxes.

The form of it.

The vulgar form of a Mercurial Oyntment, and chiefly in use for the Itch, is this.

Take of Quick-silver reduced into small paticles with an acid, or (as they say) kill'd, an ounce and a half, fresh Hogs Lard six ounces, incorporate them well, stirring them long in a Stone or Glasse-mortar.

*A Mercurial
Water for the
Itch.*

Neither only under the form of an Oyntment, but also after many other wayes the aforesaid Medicines are wont to be often used. For the fume of Cinabar (which is prepared of Mercury with Sulphur) cast upon Coals and taken in at the mouth, or striking the superficies of the Body, cures the Pſora. The Mercurial Cosmetick before described

scribed being weaker by two degrees, if it be applyed upon the Skin, chiefly on the ulcerated places, it kills the Scab. Notwithstanding the use of these is not always so secure as to be administred every where to all persons. P H A R.
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Baths are prepared of Sulphur and Vegetables, either apart or together, being *Barbs.* boyled in water which heal this Disease not as a common Bath, by only washing off the filthiness of the Skin, but also by destroying the ferment thereof. Moreover, beside these there is another more easie and neater manner of healing the Itch, *viz.* Let a Shirt boyled with Powder of Brimstone in Spring-water, and dried by the Sun or Fire, be worn next the body for four or five dayes; for so that disease is *A Sulphureous Shirt.* wont to be cured without bathing, or nastiness of anointing, or evil smell.

If the *Ætiologie* of these be enquired into, and first why Brimstone is such a Specifick Antidote against the Itch, that poor and ordinary men (who have not wherewithal to use any other Medicine) do take against this Distemper inwardly only powder of Brimstone with Milk, and administer it outwardly with Butter, I have already in part given an account, where we have unfolded the balsamick vertue of Brimstone towards the Lungs. Namely, it is a good expedient in either case, inasmuch as it destroys the acidities of the Blood and Humours, and all the exotick and corrupting roughnesses, and restores a benign disposition to every Juice, *viz.* a mild and unctuous: and so the Particles of Brimstone any way outwardly applyed, do easily enter into the pores of the skin, and being admitted inward, do forthwith work upon the ulcerous Ichor there abounding, kill the Salts there predominating, and procure a Balsamick nature to the cutaneous Juice, that it may afterwards agree with the Blood and Serum continually flowing to it. *Why Sulphur is the Antidote of the Psora.*

As to Mercury, it is no wonder if Medicines prepared hereof do thoroughly heal the places of the skin affected with the Psora wherever applyed, for by the application hereof, wheals and pushes, and all malignant ulcers, *viz.* Venereal and Scorbutick, are wont to be tamed. Neither is it a thing to be admired, that these Remedies administred in any private places, as long as they provoke salivation, are a Cure of an Universal Itch; but really that without spitting they can produce such an effect, as that a Girdle wherein Quick-silver is sowed and worn about the Loyns, should abolish the Scab of the whole body, and that sometimes without any sensible evacuation or harm caused thereby, I say the reason hereof is not so easily apparent. *How Mercury cures this Disease.*

Yet for the solution hereof, we must say that the Particles of Mercury being able to extinguish the scabbiness of every Itchy ferment, when they are applyed to any private part, do presently take away the Scab of that place; and besides being caught by the venous blood, and diffused through the whole mass thereof, and a little after they are not only carried back by the Arterious blood to the same place where taken in, but being brought outward every where, they are deposited in the Skin of the whole body, and in the same place destroy every Miasma of the Scab. If it then shall happen that these Mercurial particles, after they have finished the Cure, should be all evaporated again out of the Skin, no salivation afterwards, or other prejudice will follow. *The reason of its vertue.*

SECT. III. CHAP. VII.

Of the Impetigo, or Lepra of the Greeks.

After the Scab with the Itch, it follows that we treat of another Distemper, a little a-kin to this by reason of the breakings out of little pustules, which is commonly call'd *Impetigo*, by some a Tetter and Morphew, and by others the Leprosie of the Greeks. And as it gains several names, so they are variously applied by Authors, and by these they design one kind of Disease, and by those another kind. Wherefore, as the names of this Distemper are variously confounded, and perhaps that as to its nature and formal appearance it has been various in divers Regions, neither may it be altogether the same in our generation as in former times, for this cause my business here shall not be to describe this disease according to Books, but from the proper observation of the Patients themselves. *Several names of the Impetigo.*

The Impetigo is wont to arise and affect after this manner; to wit, little wheals or red pustules, sometimes single, and sometimes many together, are raised in divers parts *It is described according to its appearances.*

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parts of the body, but chiefly in the Arms or Thighs; to each of which, new ones every where are adjoyned, (the Disease augmenting) and in a short space of time there become many heaps of risings of that kind, like clusters. For the little pimples breaking out daily near to their stemme, and spreading still larger, diffuse themselves into a Circle, and so cause every heap of Eruptions to be enlarged. The rough superficies of each appears something white and scaly, so that upon scratching the scales fall off, and often a thin Ichor sweats out, which being presently dried up again, hardens into a shelly scale.

These Clusters of little Pimples being first small and fewer, appear perhaps three or four in the Arm or Thigh, or other particular member, about the bigness of a Penny or half a dram: but afterwards, if the disease be suffered to augment, they break out every where more frequent, which being leisurely encreased in their ground, afterwards appear to equal or exceed the bigness of a Silver Crown, but not always round or of a regular Figure, but diversly formed. Moreover there is no stop in this condition, but the distemper, unless it be restrained with Medicine, breaking out still in more places, and creeping on every where in broadness, at length not only covers over the whole member but also the whole body with a leprous dry scurf; and this kind of Impetigo the Ancients call'd by reason of its outrage *Ayeur*, and for the most part accounted it incurable.

*The differences
of this disease.*

From hence the chief differences of this disease are made known; and in the first place as it is less or more malignant according to the fashion thereof, it is distinguished, as it comes nearer the nature of the Scab, or Leprosie, or as it is in a middle condition between both. We are also to note, this distemper sometimes infests some particular members, as the Arms or Thighs, the rest of the body being untoucht; but sometimes it begins together in all parts, and every where excites scatteringly little Pimples or Clusters thereof. Also eruptions of this kind are in some for a season, or periodical, and for the most part infest those persons during Winter only, vanishing away about Summer; likewise on the contrary, in others they abhorre Winter, and are wont to observe the season of the Swallow going and coming, but in most others the Disease being continual grants no truce, yea it hath neither remission nor mediocrity.

*How it differs
from the Psora
and Leprosie.*

Moreover we must distinguish an Impetigo from other Diseases a kin to it, and first from the Scab, and the Leprosie. It differs from the former as to the form of the Pustules; for every where in the Psora they are single and remote from one another, although by small spaces; here most of them break out in Clusters, concurrently, and as it were disjoyned by branches with great interspaces. But between these distempers a notable difference yet arises, in that the Scab is wont easily or scarce otherwise to be propagated or arise, but by Contagion; but the infection of an Impetigo is so seldom or never, that the Miasma from the Husband doth not pass to the wife, or from her to him, though they lye together.

Also this Disease differs from the Leprosie, as well in respect of the form of its eruption, as of its contagion, which is likewise active in this, as in the Psora; and the breaking out is much larger and more horrid, viz. it is every where shelly and scaly, without intermission, and diffused through the whole body.

*The material
cause not a hu-
mour of the
skin.*

*But tartarous
Concretions be-
got in the blood.*

From hence it is manifest, that the material cause of an Impetigo, is not merely a cutaneous humour, by reason of effluvia's or a taint received from without, or depraved by reason of other accidents, and degenerated from its temperament; because it is not easily communicated to others by Contagion, as in the Psora, neither is it immediately dispersed throughout the whole body. But indeed little Pustules breaking out first about the initiations of the Disease seem therefore to proceed, for that certain acid salt Concretions happen to be in the mass of Blood (like Tartar in Wine) which when they can neither be concocted or again dissolved, are here thrust out into the skin, as there into the sides of the Vessel. As long as these Concretions are small and few, they are conveyed into the skin in this or that member, and by one or two branches of an Artery; then as Nature is wont to continue the same manner of excretion as it began, the matter being carryed every where by the same vessels, to the same nests, near the first wheals it causes heaps of others round about them; but afterwards when the dyscrasie of the blood is daily augmented, and that Tartarous matter is generated more plentifully in the mass thereof, more portions are conveyed by other Arteries, and still by more to the outward places: and for that cause also more pimples break out both in the same, and other members, which a new matter coming continually by the same Arteries, and being placed close to the former, enlarges them every day, and every where dilates them by the addition of other pustules; and at length if this sort of Tartar of the blood augment hugely, being

carried

carried out by more or all the Arteries together, it is fastened in the skin, and in process of time covers over all the superficies thereof with a scaly or downright leprous shell: And then that cutaneous humour being wholly corrupted, promotes the disease it self; for it causes the stock of the morbid matter to be encreased, by polluting more, or rather poisoning the blood and humours, whilst they pass in Circulation; moreover dismissing the corruptive steams from it self, it renders the Contagion of the same disease unto others.

Wherefore, both the procuring and conjunct causes of this Disease consist in this, *The next cause* for that without any fault of the skin, it happens that the blood is filled with salt of it. Particles of a various disposition and condition; (into the preceding cause of which disposition we will anon inquire) and where those fixt and acid Salts are especially predominant (as the manner is) they mutually embrace one another, and so grow together into Tartarous Concretions; which being thrust forth into the blood, cause eruptions of wheals, as it were nests of the Disease; then they being daily and leisurely encreased both in number and largeness, according to the supply of matter, they produce the beginning, augmentation, and state of this disease.

As to what relates to the antecedent and evident causes, there are two chief kinds *The evident* of occasions from which this distemper for the most part derives its origine; to wit, *causes.* an evil manner of Diet, or a taint of the Scurvy, or Pox, or other Diseases left in the body, being ill, or not at all cured. We will weigh a little the reasons of each of these.

As to the former, besides the common irregularities in Diet, wherein some being *Irregularities* too much addicted to eating of flesh salted and afterwards dried in the Sun or Smoak, *in Diet.* and the drinking of acid Wines, do easily contract this malady; Also it is a vulgar observation, that very many are disposed thereunto by the too frequent or daily feeding on Pork, and Fish, and especially Shell-fish. There is a notable instance of the former, which is, that the food was chiefly forbidden the Jews for prevention of this disease. Also there is an example of the other, that in time past the Inhabitants of Cornwall for the most part dwelling on the Sea-coast, inasmuch as the poorer sort were fed with Fish, became very obnoxious to Leprous Distempers; infomuch that for their relief many Hospitals were erected in that country. That I may hint in a few words the reason hereof, I am apt to think whether that food is rancid, or *The reason thereof inquired into.* otherwise disproportionate, that it conveys particles not rightly mixed, not easily to be subdued to our blood, which being so heterogeneous and largely heapt up by a long use of such Diet, the saline particles of which kind do easily associate themselves, and so do constitute Tartarous Coagulations to be exterminated in the skin, and the seeds of the Leprosie or of the Impetiginous Evil.

But yet a plentiful Crop is begot from the taint of the Scurvy and pox left in the body, and afterwards by the combination of Salts and Sulphur exalted to extremity. *It often follows the Pox and Scurvy.* We have elsewhere discovered the reasons of the former disease, and especially of the foresaid symptome coming after it, which being accomodated to our present Hypothesis do make it more clear. And it so often happens, that pustulous eruptions of this sort do follow an inveterate Pox, although it seem to be cured, that none distempered almost with these, wants the suspicion of that shameful Disease; so that the first Question of a Physician in such a case being consulted, is, Whether the Patient, have not at some time formerly contracted that Distemper? For surely the Corruptions of the blood, after they are by a long stay become altogether heterogeneous and indomitable, at length acquire to themselves salt Particles, wherewith growing into such like Tartarous Concretions, and being thrust forth into the skin, produce those Impetiginous Pustles:

As to the Prognostick part of this Disease, although it seldom threatens death or imminent danger, yet after it hath taken deep root, the Cure is very difficult, if at all: The Impetigo first beginning, and exciting a few Pustules, and knots of them, perhaps in one or two members, sometimes admits of Cure, but hardly without a most efficacious remedy. But if the Disease proceed so far, that the frequent and broad clusters of wheals appear dispers'd throughout the body, then small remedies effect nothing, and the great ones howsoever diligently observed, will not easily perform a Cure. But if the Disease, maugre all remedies advance daily, and encrease at length into a Leprosie, *Celsus* judges it impossible to be cured. and therefore we must wholly abstain from it. *Its Prognosticks.*

There are two chief Indications concerning the Cure of an impetigo, viz. Prefer- *The Cure.* vatory, which respects the cause of this Disease, and the Curatory, which relates to the symptomes, viz. the pustulous Eruptions. The vital Indication hath seldom place *Two chief Indications.* here, unless in a desperate condition, where sleep and strength fail. The Method of

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Curing ought to begin with the Preservatory Indication, which takes away the Causes of the Disease by inward remedies, for otherwise external (as in the Pfora) are never administred with success; but the roots of the disease in the blood being cut off, the cutaneous sproutings quickly consume away: for the taking them away, we must proceed in one manner when the Impetigo begins by it self, and in somewhat a different manner when it follows an inveterate Scurvy or Pox, being ill or not at all cured. We will consider each case througly by it self, and distinctly.

How to be cured, the Disease beginning of it self.

The evident causes to be first removed.

The conjunct Causes how taken away.

The chief Remedies made known.

1. A Purge.

Therefore whensoever this Disease is simple, and primary, and being yet New, let the evident and extern Causes be removed; let the manner of Diet, and unwholsomness of Air be corrected; therefore those that have been lately too much accustomed to salt Diet, and the flesh of Pork and Fish, let them change to Diet of good Juice and easie of digestion. They that inhabit the Sea-coast, or Fenny places, let them remove to a dry and clear Air; in the mean while let no less care be had to their Drink, by declining thick and foggy Ale, and small acid and Wines too much abounding with Tartar: at length let care be taken lest their Drink or Food be dressed with any Mineral waters that are apt to petrifie.

Secondly, In respect of the conjunct and procuring Cause, there are two chief Intentions of Cure, viz. that the impurities of the bowels and humours be quickly purged out; also that the acid saline distemperatures of the blood and nervous Juice be altered (whereby the Tartarous matter may be the less engendred in them;) for these purposes Medicines both evacuating and altering are prescribed of several kinds. Notwithstanding, because not all, but the greatest remedies are here convenient, those which are most chiefly of use and available, are Catharticks, Phlebotomy, Whey, Chalybeate Waters, Jucy expressions of Herbs, Decoctions of Woods, steeld Medicines and Salivation. Some certain Models of each of these, and the manner of using them, we will annex.

Wherefore in the first place, universal purging and bleeding being celebrated (as in the cure of the Pfora) we appoint the following Tincture or purging Infusion, whose dose is from six to eight ounces, to be repeated in six or seven dayes.

A purging Infusion.

Take of the roots of sharp-pointed Docks dried, Polypodie of the Oak, of each half an ounce, Senna ten drams, Epithymum six drams, Rhubarb, Mechoacan of each half an ounce, yellow Sanders two drams, Celtrick Nard half a dram, Salt of Tartar one dram and a half, put them in a glass with three pints of White-wine, water of Elder-flowers one pound, let them stand stopd in a cold place three dayes, pour off daily as much of the clear liquor as is sufficient.

2. Whey.

Secondly, For sweetning of the Blood, and washing of the Salts thereof, let simple Whey, two or three pints, or with the infusion of Fumitory, Chicory, and sharp-pointed Docks, be drunk every morning, for twenty or thirty dayes, if the Stomach will bear it, and likewise evening and early in the morning, let a dose of the ensuing Electuary be swallowed.

An Electuary.

Take Conserve of the roots of sharp-pointed Dock six ounces, Crabs-eyes, Coral prepared, of each two drams, Ivory one dram, Powder of Lignum Aloes, yellow Sanders, of each a dram and a half, Sal Prunella two drams, Vitriol of Mars a dram and a half, Syrup of juice of Wood-sorrel what suffices to make an Electuary, the dose two drams.

3. Steeld Waters.

Thirdly, For the same reason that Whey, your Iron Mineral waters are prescribed for this Disease, and do oft notably help: for when all the other remedies have been in vain, I have with those alone cured a painfull and almost leprous Impetigo. Moreover, for more efficacy sake, let the use of Sal Prunella or Vitriol of Mars, or of the Electuary but now mentioned, be dexterously adjoyned.

4. Decoctions of Woods.

Fourthly, In some indued with too much Serum, and a watery Constitution, where the drinking Whey are Mineral waters or less requisite, it is sometimes expedient that a Decoction of the Woods be assumed at Physical hours, and also constantly instead of ordinary drink:

Take the Shavings of Willow half a pound, of Sarsaperilla eight ounces, white Sanders, Lignum Lentiscinum, of each two ounces, Shavings of Ivory and Harts-horn, of each six drams, Filings of Tin, crude Antimony, of each four ounces tyed in a rag, of Liqueurish one ounce, infuse them in sixteen pound of Spring-water, and boyl them to half, keep it strained for use.

Fifthly,

Fifthly, Medicines of *Steel*, in that they are every where accounted among the more excellent Remedies, are wont seldom to be omitted in this Disease, although not frequently given with success: for most Preparations of Steel, wherein the Sulphureous Particles predominate, inasmuch as they ferment the blood, and irritate it into Critical Effervescences, do cause these impetiginous eruptions to augment rather than diminish; notwithstanding the Salt, Syrup, Tinctures, and infusions of Vitriol, inasmuch as they fix the Blood, and something restrain the raging of the Salts, do fitly enough agree with the Intention of Cure now proposed; but being weak in efficacy, they do not prevail against so Herculean a Disease.

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5. Medicines
of Steel.

Wherefore Sixthly, these and many other Remedies nothing availing, many commend *Salivation*, as the stoutest Wrestler and only match for such an Enemy. Yet the event doth not alwayes answer this great expectation; for I have experimented this remedy without success in four Patients labouring under a painfull Impetigo, which had resisted other Medicines. Some of these were provok'd to abundant Spitting by Uction with Quick-silver, others by doses of Solar Precipitate; which they have endured for the space of twenty dayes; which time being elapsed all the scaly eruptions and clusters of wheals have vanished; notwithstanding, to confirm the Cure, a Diet-drink of the Decoction of Sarsa was appointed, and frequent sweating under a Cradle, and due purgation between, was continued for a month: Notwithstanding, this Course being finished, when no footsteps of the distemper seemed to be left, within another month a new stock of the same Disease beginning to break out, it encreased quickly to its usual maturity. Moreover when one of them would repeat this course, and another after two relapses would experiment it the third time, both of them at length after great sufferings of Pain dispaired of Cure: whence it is manifest that the Venereal Distemper, although highly malignant, and raising most filthy Ulcers consuming the flesh and bones, is more easily and certainly cured than the Impetigo.

6. Salivation.

Salivation does
not always cure
this Disease.

The reason whereof if we enquire, may plainly be conceived, for that the cause of the latter Disease consists in a malignant and altogether heterogeneous pollution, infecting and poysoning the blood and nervous Liquor for a certain time, but not altogether overthrowing, or for ever depraving its temperament; wherefore the Cure is performed by Salivation, or a sudorifick Diet, eradicating all that venom, and then the natural disposition of the blood and humours remains entire: But in a more difficult Impetigo, the Elemental particles and first Constitutives of the blood are corrupted, insomuch that unless the natural Disposition and Constitution of these are restored, all Evacuations and expurgations of any venomous, malignant and heterogeneous matter, however plentiful and eradivative, do little or nothing prevail. Wherefore, many famous Physicians not undeservedly judg'd this Disease being confirmed and raised to the borders of a Leprosie, to be hardly or never cured.

Why the Impetigo
is more difficult
of Cure than
the Pox.

Secondly, No better event attends this malady ensuing upon an inveterate Scurvy; perhaps hence the intentions of healing are a little more certain when this distemper is placed as the Basis or root of that; to wit, that the chief curing Indication being taken from thence, we must chiefly insist upon Antiscorbutical remedies; but the more sharp and hot of this kind, as the Garden Scurvy-grass, Water-crelles, the Horse-rhadiſh, Pepperwort, and others too much irritating the blood, inasmuch as they dissolve the temperament thereof more, and drive out more plentifully the Tartarous Coagulum to the skin, are always discovered to be more prejudicial then advantageous; and for this reason, the use of Baths, or bathing in hot waters, which namely evacuate the humours of the whole body by an abundant Evaporation, and cleanse the pores of the skin, and seem very available in this malady, often-times are so far from helping, that those Eruptions are wont to be exasperated from thence and very much encreased: for I have known many not extreemly Impetiginous, to have gone to our Baths, to bathe in the hot waters, that have returned altogether Leprous. Wherefore, when the Symptoms of this distemper arise from a scorbutick evil, all elastick things are to be avoided, and only the more temperate, endued with a Nitrous, Vitriolick or volatile Salt, are to be administred. We will lay down some Models of each sort; As first Crystal Mineral, Juices of some Herbs and Decoctions, Salt and Mineral purging Waters, are most predominant with a Nitrous Salt.

Impetigo succeeding a Scurvy, how to be cured.

Hot antiscorbuticks do not agree.

Nor Baths.

But only the more temperate Remedies endued with a nitrous, vitriolick or volatile Salt.

Take of Crystal Mineral, or Nitre purified one ounce, Flowers of Sal Armoniack Forms of Nitrous Medicines.
one dram, bruiſe them in a glaſs Mortar, give one dram three or four times in twenty four hours.

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Water of Sow-thistles.

Take of the leaves of Housleek the greater two handfuls, bruise it and boyl it in two pound and a half of new Milk till it turn to Curds and Whey, strain it, and take a pint of the clear liquor twice in a day.

Take of the leaves of Dandelyon six handfuls, bruise them, and put them into a glazed earthen pot with a cover, which put in an Oven after the bread is drawn out, let it stand six or seven hours, then pour it through a Strainer, the dose is four ounces to six of the clear liquor, thrice or oftener in a day.

Cucumbers.

Cucumbers being endowed with a Nitrous quality are advantagious by experience against this disease, wherefore in lieu of a Sallad let them be plentifully and often eaten; moreover three or four of them cut into slices, let them be infused, and stopt close, in three pints of Spring-water all night; to the clear liquor poured out, add Sal Prunella two or three drams, the dose is half a pint thrice or oftener in a day. For the same purpose Decoctions of the leaves in running water together with the fruit do profit.

Purging Mineral Waters.

1. Certain mineral purging waters, of which sort are chiefly those of North-hall, an Analysis being made up by Evaporation, manifestly shew a Nitrous Salt with which they are imbued, and I have sometimes found the daily drinking about four pints for many dayes, to help against a gentle Impetigo.

Vitriolick acid waters.

2. But as I have before hinted, those Mineral waters endued with a vitriolic Salt, of which kind are the SPAW, and Tunbridge, and Astrop Wells, do far excell those Nitrous, and all other Remedies, and do more prevail in the Cure of an Impetigo. To those Patients that have not the opportunity of using these waters, I used to give with good success against this disease common water impregnated with our Steel, and so rendring most exactly the gust of those Mineral waters. By reason of Mineral Salts, or at least the Mercurial Particles in them, Tin and Antimony are oft in use in the Cure of the Impetigo, and are usually prescribed with other remedies. Let the Filings of Tin, and Powder of crude Antimony, be infused in Ale for ordinary Drink: also Decoctions of *Sarsa* made with the woods, are found beneficial against this Distemper,

Medicines of Tin and Antimony.

3. Medicines endued with a volatile Salt.

Chiefly prepared of Vipers.

3. The use of a Viper, and the Preparations thereof, doth enough commend the wonderful vertue of volatile Salts in a grievous Impetigo, and also in curing the Leprosie it self. This Antidote of that Disease is reported to be found out first by a casual experiment, inasmuch (as *Galen* reports) that drink being pour'd out of a Bottle wherein a Viper was put to poyson one labouring with an Elephantiasis, and so given him to free him from his misery, prov'd his remedy, and what was destined for his murder, dispatched an incurable Disease. Hither relates the Analogy, taken from the nature of this Animal, whence they collect that it helps in this Disease; because the Viper yearly shakes off his scaly Coat, therefore some thinks its particles prevalent to throw off the leprous skin of a diseased man; but though we do not attribute much to these things, yet it is manifest by frequent observation, that remedies of a Viper do profit in the Impetigo and Leprosie; the true reason whereof ought to be ascribed much to the volatile Salt wherewith this Animal is endued. For the particles hereof destroy the fixt and acid Salts predominating in the blood of the diseased, and dissolve their combinations; notwithstanding, the Salt, Spirit, and Oyl chymically extracted out of Vipers, by reason of their elastick particles, contracting an Empyreuma from the fire, profit not in this disease; as also neither Spirit nor volatile Salt of *Harts-horn*, *Soot*, *Blood*, and other the like *Armoniacks*; because by violently stirring the Blood and Humours they rather dissolve their temperament, and thrust forth the Corruptions more plentifully into the Skin. Wherefore the more simple Preparations of Vipers, as broths from their flesh boil'd in water, and Drinks impregnated by Infusions, and Decoctions, and Powders being made of them dried and beaten, are prescribed more successfully against this Disease. Moreover not only the boyl'd flesh of Vipers, but of any other kind of Oviparous Snakes being taken in lieu of ordinary food do oft afford notable relief.

But not chymically.

Broths and infusions of Vipers.

4. How the Impetigo following the Pox is to be cured.

4. The Impetigo or scaly eruption of Pimples, and formed as it were into clusters, is so frequent and familiar a symptome of an inveterate Venereal distemper, that we first ask the Patient whether something of that malignity be not concealed of which they are conscious; and if we perceive the matter such, all Specificks against this Disease, and Antiscorbuticks being omitted, we must come to the Decoctions of Woods, and those little or nothing helping, we must descend to the use of Quick-silver. And truly by this method I have cured many that were accounted Impetiginous and Leprous, (who have been handled long in vain, and wretchedly vexed with other Remedies appropriate to these diseases.) But we refer this sort of

of Impetigo to the Pathology of the Venereal distemper, whereto it is an Appen- P H A R.

Part. II.
 ix. The second Indication curatory relating to the Disease it self, and the primary symptom, to wit, the scaly eruptions and clusters of Pustules, prescribes Topical Remedies to be applyed to the outer Skin for the removing these effects; for which purpose in the first place Baths and Liniments are convenient: which yet rarely or never help of themselves, unless the procuring cause, that is, the Tartarous disposition of Blood be first purged out. The second Indication Curatory

There is a vast medley of Topicks of this sort vulgarly vented; as well by Physicians as by Empiricks and Quacks; among all which notwithstanding, Baths or Liniments compounded of Tar do far excell all other Remedies of either kind, insomuch that we should only use these but for their ill savour; wherefore we will annex some models of Compositions both with and without Tar. Topicks of Tar are the best.

Wherefore, for Baths it is common to take water out of Tubs wherein Tar hath long stood, and impregnated with the infusion thereof: Or,

Take of Tarre two pound, and with white Ashes sifted incorporate it into a gross mass, which boyl in a sufficient quantity of Spring-water, adding leaves of Ground-Ivy, Fumitory, white Horehound, the roots of sharp-pointed Dock, Enula-campane, of each four handfuls, make a Bath to be used with government; Or let such a Decoction be prepared without Tarre for Patients abhorring the smell.

Sulphureous Baths as well Natural as Artificial are found by experience less appropriate, yea for the most part the former do prejudice; Moreover, every bathing ought cautiously to be administred: for because this administration exagitates the blood, and puts it into an Effervesence, its Temperament is endangered (as has been said) rather to be dissolved, and the corruption to be spread more plentifully over the Skin. Baths.

2. Liniments whose use is more safe, and convenient, are of a Triple kind or Liniments. degree, viz. Gentle, Indifferent, and most strong; of each of these we will propound one or two patterns.

1. First therefore in a slighter Impetigo, when the Eruptions and Clusters are small, Fasting Spittle is commended; likewise the weeping of green Wood in the Fire, also mere rubbing them with roots of sharp-pointed Docks bruised and macerated Vinegar: Or, 1. Mild Liniments.

Take of Oyl of Tartar per deliquium, Oyl of Nuts or Almonds by expression of each equal parts, make a Liniment to be used to the parts affected twice in aday.

2. Liniments of the Second kind have Tarre for an Ingredient, which is esteemed above all. 2. Stronger, of Tar.

Take of Oynment of Roses six ounces, of Tarre two ounces, melt them together: Or, Take a fat piece of Weather-mutton, which stick with the roots of sharp-pointed Docks, spit it and roast it, and in the mean while baste it with Tarre dropt leisurely upon it; the Dripping being received in a Vessel under it, keep it for an Oynment most excellent for an Impetigo.

3. The most prevalent Liniments are Mercurial, viz. those made with Quick-silver or Præcipitate. Let the model of the former be that prescribed already against the Scab; for the other, 3. The strongest of Mercury.

Take of white Præcipitate three drams, Oynment of Roses three ounces, mix them, for to anoynt the parts chiefly affected.

The use of these ought chiefly to be suspected in this Malady; for if spitting be raised, that great glut of matter impacted in the pores of the Skin will be moved, which if the whole together rushing too much towards the *Ductus Salivales*, gather about the parts of the Throat, will endanger suffocation.

Some years since a Virgin of a Noble Family, being of a hot Temperament, and endowed naturally with a sharp and salt blood, after being a long time obnoxious to an Impetigo, almost from her Cradle, about her riper years began to be afflicted more grievously; for the clusters of scaly Pustules covered not only her Arms and Thighs every where, and the other covered parts of her body, but Also her Hands and Face were so defiled, that she was ashamed to appear abroad or converse with others of her rank. Lesser remedies almost innumerable were exhibited without success; A notable Relation.

PHAR.
Part. II.

Salivation cures
for a time the
Impetigo, but
with a relapse.

That remedy re-
peated, did not
thoroughly cure
the Disease.

cess; by using Baths she at first appeared releived, but at length grew worse thereby. *Astroe* Wells which have cured some, afforded her little or no relief. Wherefore when all ordinary means would not effect any thing, I propounded Salivation, as a remedy more prevalent then all the rest and (as it is accounted) the last. When the Parents and Patient readily consented to this advice, preparing her body duely by Purgation and Phlebotomy, I gave her (after our manner) Pills of Solar Præcipitate two dayes, and after the interval of one day, the remedy being repeated the next, an abundant and laudable spitting began, and continued for a month without any ill symptome; to keep which in its due tenour, I applyed a Mercurial Oyntment to the bending of the Joynts and the places most affected, one while to one, another while to another. Before the finishing of this course, all the Eruptions vanished; notwithstanding to confirm the Cure, as also for the extirpation of the Mercury, she remained another month in Purging, Sweating, and Diet of the Decoction of *Sarsa*, *China*, &c. in which time seeming perfectly cured, she so remained for about forty dayes. But afterwards though she observed an exact course of Diet, the same disease began to bud forth again, and leisurely encreasing, at length it advanced into its former state. I being confounded with this event, perswaded her to hope an alteration for the better after her Menstrual Flux, which was suddenly expected. Notwithstanding, after long delay that Crisis at length happening, and managing her self regularly after it, brought no Cure or ease of that Disease, but rather a fresh assault. Wherefore recourse was had again to Physick and divers Remedies assay'd, all which when they became frustrate, her friends importuned that she might salivate again, to wit, allured by this hope, that that method which cured for a short space, being administer'd again, would cure her either for a longer space or altogether. Wherefore according to their wishes, the same course of spitting and sweating repeated for two months space, and thereupon the Pustules every where going off, the Noble Virgin seem'd again wholly to recover her health. But within a fortnight after the course finished, the Pustules, and their Clusters again appeared, and leisurely encreasing daily in number and bulk at length grew fouler then before, inasmuch that like an *Hydra*, after the loss of one head this disease received sevenfold.

I knew another strong man endowed with a lusty habit of Body, who after he had laboured with an Impetigo many years, the malady still encreasing, and being advanced to the highest, he was covered all over with a white Scurf, as it were leprous, that every night the Scales fell off like Bran in great plenty in his bed, and might be gathered up in heaps. This man for Cures sake first tryed the ordinary Remedies of every kind, notwithstanding without success; and afterwards trying a lighter Salivation, found himself nothing better: but afterwards the same method being repeated, by a long and painful Spitting, he seemed to be restored to health; but within three months the same disease budding out, in a short space arrived to its former outrageousness; Moreover, when he had undergone the third time that most painfull Remedy, that affect, which seemed expelled for a certain time, returned again; and afterwards mangre this and all methods, it exercis'd its Tyranny during the Patients life. It will not be requisite here to discourse any thing of the *Lepros*, which being only a more intense degree of the former Malady, for the most part admits of no Cure. As to what relates to other Tumours, and their manifold kinds, and the *Ætiologies* or Reasons of each, I confess I am scarce able to contain my self, but that I should enter upon that pleasant Field of Speculation. But this seems as irrational and unusual, as for one wearied with a long Course, and breathless at the end, running beyond his Posts presently to begin a new Race.

F I N I S.

A
TRACT
OF THE
SCURVY.

CHAP. I.

THE CONTENTS.

A Description of the Scurvy. The Internal and nearest Cause of it is chiefly in the Blood, and also in some part radicated in the Nervous Liquor.

THere is so rare Mention, and so slender Description in the ancient PHAR. Medicine of this Disease, which we call the Scurvy, that some have Part. II. doubted, whether there were in the times of old any such Sickness, though now epidemical in many places, and almost every where ordinary, and with which every one is troubled, or at least thinks himself troubled with it; and which like the Pox and the Rickets, is derived a great way down to the Children: but certainly it is plain by the testimonies of *Hippocrates, Aretæus, Pliny*, and others, that this Affection though known by other Names, was taken notice of by the Ancients, and that its cure hath been treated of though after a slender manner.

Being not very solicitous concerning the appellations of this Disease, we will presently proceed to the knowledge and application of its Nature: which as it is so diffuse and extends its self into so various and manifold Symptoms, that it can neither be comprehended by one definition, or scarce by a singular description, it will seem best first of all to recite all the *Phænomena* of this Disease, or to relate the History of the more notable accidents of it, and thence to accommodate a certain *Hypothesis* for the right solving its appearances.

As to the first, there are reckoned up a great company of Symptoms in the Scurvy, and manifold Affections and of diverse kinds; and which sometimes are of an opposite or contrary nature to it: yea if any unusual accident, never before heard of in an humane Body happen, when it cannot be referred to any other kind of Disease certainly, we presently without doubting pronounce it the Scurvy: so that this Disease, like one condemned, and of an evil Name, suffers for others faults:

A recital of the chief symptoms of the Scurvy.

P H A R. faults: In the mean time it is wont to excite symptoms very many from its own power, which appear almost in every part of the Body, a recital of which will be best performed by a distribution of the parts of the Body. Therefore that we may thorowly handle the marks of the Scurvy, from the beginning to the end, we will begin first from the fountain of it in the Head: and to this belong great and habitual Headaches, and those either by certain fits, or at certain times, sometimes a numbness or stupidness of Spirits, sometimes pertinacious Wakings, frequent Giddinesses, and Swimmings in the head, Convulsions, Palsies, plentiful Spittings, Ulcers in the Gums, a looseness of Teeth, a stinking in the Mouth. Secondly, sometimes in the region of the Breast, pains in divers parts of its membranes, and chiefly about the *Sternum*, which being often sharp and piercing, do miserably torment those labouring with this Disease night and day, a frequent *Asthma*, difficult and unequal breathing, a straitness of the Breast, a striving with an empty Cough and inordinate Pulse, a trembling of the Heart, frequent Swoonings, and often faintness of Spirits, or a fear of it almost continual. Thirdly, this Disease, as it were fixing its chief seat in the lower belly, produces an Iliad of Diseases: for often they have Nauseousness, Vomitings, Belchings, gnawing at the Heart, Inflammations, and grumbling of the *Hypochondria*, often Colicks, and troublesome Grievs running up and down here and there, almost a continual *Diarrhea* or Looseness, sometimes a Dysentery or Flux, or a desire of going to stool, a wasting away of the Flesh, and sometimes an *Ascitis*.

The Urine, for the most part red and lixivial, with a crustiness swimming in it, or else sticking to the Urinal: sometimes also by fits it is pale and waterish and in abundance. Fourthly, besides these Affects of the Belly, there are wandring pains and those not seldom highly painful, and troubling chiefly at night in the external Members, yea thorow the whole habit of the Body they feel a heaviness and spontaneous weariness, a wasting of the Flesh, an ach about the Loyns, and a debility and enervation of other Members; in the Skin spots of several colours, Tumours, Pimples, and often venomous Ulcers shew themselves about the Muscles: a Numbness, Stiffness and pricking, and as it were the ascension of a cold air, *As* Contractions, and leapings of the Tendons: Besides to scorbutical Persons happen inordinations of the Blood, uncertain Effervescencies, wandring Intemperaments, Erratick Fevers and great Hemorrhagies. Besides these more common and accustomed symptoms of the Scurvy, of which some have more some less, and which infest them now after one manner, and now after another manner, and in another kind, oftentimes there happen other unaccustomed and prodigious accidents to this Disease.

For the more full knowledge of this Disease, it seems good that we here observe as it were lightly, what concerns the original, beginning or first invasion of it. For we are to inform you, that the Scurvy may be produced by reason of several Causes and Occasions: for although an ill course of Diet, a sedentary life, the inordination of the Spleen, and the Crudities heaped up in the first passages are very much accused; yet there is wont to be a further cause, as the unwholsomness of the Air, and the evil *Crafs* of the blood, vitiated by former Diseases: wherefore the Scurvy or Scorbutic is often venacular or peculiar to marish places, and to the Sea Coasts: and frequently falls on those who much use the Sea, and feed much upon salt and smok-dry'd Meats, and who are forced to drink putrified Water: and often succeeds to continual Fevers, and to other chronical Diseases ill cured; also to great Hemorrhagies and other evacuations; and to usual excretions, as the Piles and monthly Courses being suppressed: Moreover this Disease, without any great forerunning cause, is excited not seldom by contagion, and sometimes is also hereditary.

It manifestly appears from what we have observed concerning this scorbutick Affection, that the material cause of this Disease is not contained in any private place or singular Mine, but is diffused thorow the whole body and every part of it, both within and without: from whence we gather that the scorbutick Miasm or Contagion, is poured forth, either in the Blood or in the Nervous Juice or in both. And indeed, the eruptions of Spots, and little wheelks, the redness, and as it were lixivate urine, or like lie, plainly testifie the Contagion to be placed in the effervency and inordinateness of the Blood; to which another like prognostick may be added, the divers production of this disease, which for the most part, succeeds the depravation of the Mass of Blood: no less the troublesome dolours, both within in the Membranes & without in the Muscles, the debility of the Members or resolutions, the *Vertigo*, Cramps, and frequent faintings of the Spirits declare the fault or vice to be in the nervous Juice. Therefore, when both the general Humours are in fault, we will see which is first and chiefly vitiated, and from whence it draws its Contagion, and by what means it communicates its harm to another humour, and to any other parts, that are wont to be affected.

As to the Blood (in whose mass the Scurvy seems most of all to be rooted) we have elsewhere shown, that its disposition is even almost of the same temper, and of such like particles composed, as Wine: for that we have hinted, the Blood, even as Wine, to be sick, chiefly from two causes, to wit, either, because that there is something extraneous, and not to be truly mingled with it, poured into one or the other, or else because the disposition of the Liquor, or its temperament is perverted, that is, for as much as some things that are to be in Subjection, either to one Element or to another, and which ought to be subjugated, are exalted.

As to the first we have observ'd of some, that when the *faces*, are first secreted, and thrust up from the bottom, they are by being moved, lifted up; or if any exotick thing be cast into the Pipe, as Sewer or Sulphur, presently a notable perturbation is stir'd up; by which, unless it be soon quieted, the whole *Crafsis* of the Wine will be in danger to be subverted. In like manner there are many things not miscible, which disturb the Motion and Circulation of the Blood, by being poured into it, and hinder it, that it cannot perform its due œconomy, the nutritious Juice being full of the feculencies, does inordinately ferment the Blood, and as we have formerly shown; that Liquor becoming degenerate stirs up the paroxysms of intermitting feavers; the vaporous Recrements of the Blood, the ferous, bilous, and melancholy being retained in the bosom of it, bring forth Catarrhs, Dropsies, Jaundice, Mellancholly, and many other Diseases: but if that extraneous thing be removed in time, it soon, even as VVine freed from its extraneous mixture, recovers its pristine Condition. But either Liquor, being for a long time infected with those heterogeneous contents, so that the due *Crafsis* is at length degenerate, it is not then easily to be restored.

2. Besides, both Wine, and Blood, by reason of many other causes, depart from their right Temperament. As to Wine there are many ways and reasons whereby its Liquor is perverted from its legitimate disposition: which may also be parallel'd, by as many, if not more, in the dyscrasie of the Blood. (For this is often wont to be suddenly empoyson'd and broken, which does not easily happen to Wine) 1. Therefore, we may observe of Wines, that they do not sometimes attain to maturity, but for want of Spirit they remain crude, for as much as the Spirits, and the other active principles of Sulphur and Salt being overwhelmed with more thick and gross parts, cannot extricate themselves; wherefore they become without Spirit, but having a thick consistence, and ungrateful, taste degenerate into a tasteless VVine: and almost after the same way it is, when the Blood, the Spirit, and Sulphur depressed becomes crude and watry, and without Vigor, and unable to be inkindled afresh in the Heart. And this kind of disposition of the Blood *Horstius* affirms to be the cause of the scorbutick affection; but this same disposition, seems rather to infer the *Pica*, or strange longings of women with child, as also the Dropsical disposition, than the Scurvy, as we shall shew more at large anon. 2. The sulphureous parts of Wine being exalted above the rest, cause an immoderate effervescency or ebullition in the Liquor, and is called in our idiom or proper Speech, *Fretting of Wine*: In like manner, the sulphureous parts of the Blood being too much provoked or carried forth, causes a feverish intemperance, and is apt to be inflamed in the Heart, and indeed is the cause of very many feavers together. 3. Not seldom the Spirit in Wines growing weak, and the Sulphur being bound up, the saline part being carried into a flux overcomes the rest; wherefore the Liquor becomes sour. The famous *Sennertus* thinks the Blood in the Scurvy to be altered as VVine degenerated into Vinegar, which we shall shew by and by, to be otherways. And we have formerly shewed, the dyscrasie of the Blood, being grown sour, causes Mellancholy.

4. There yet remains another ill disposition of Wines, to which we may very aptly compare the scorbutick Disposition of the Blood, to wit, when the Spirit being depressed, the sulphureous and the saline Particles being combined together, are exalted, and as this comes to pass in Wines, after a two fold manner, so also by the like affection of the Blood we may deduce from thence a two fold Kind of Scurvy, as we shall shew more clearly anon. It is then a common observation in VVines, that besides their degenerating into a tasteless Liquor, and into sour Vinegar, they do sometimes, the Spirit being depressed, and the Sulphur and Salt being together exalted, become rancid, or ropy, or mucilaginous; in proper terms, *Wines that are fretted, or ropy*. In either mutation, the Spirit being subjugated, the sulphureous and the saline Particles being associated together, exceed the rest of the Elements, and cause the disposition of the Liquor, to become of their Nature. But yet the business is not performed, altogether after the same manner, in both: for that in the former dyscrasie of the Wine the Sulphur is something more potent; than the Salt, but in the latter the Salt exceeds the Sulphur: so that either of them being the stronger, their Lord,

P H A R.
Part. II.
*The Dyscrasie of
Blood and Wine
Compared.*

*As to things
not miscible
poured into
it.*

*As to the tem-
per of either va-
riously altered.*

*The Scorbutick
Dyscrasie of the
Blood-like
Wines when
they become,*

Fretted or Ropy.

P H A R
Part. II.

the Spirit, being cast off; they agree one with the other, and surmount the due tencur. The reason of either, may seem to be unfolded after this manner.

When generous Wines have grown hot for a long while, the particles being much agitated and striking one against another, the Spirit partly evaporates, and partly overwhelmed in the more thick Elements, is suppressed: In the mean time, the Sulphur (of which there is the greater plenty) being more carried forth by the agitation, and so casting off the yolk of the Spirit, adheres to the Salt, and lifting up, alters the mixture of the Liquor, which by reason of the rising up of the Sulphur combined with the Salt, becomes rancid, or fretted: In like manner, when thin Wines have been kept long, the Salt is carried forth, and depresses the Spirit, overcome by its *fluor*, and so subjected by its wat'rishness, the Liquor becomes sour or sharp; after that the Salt growing eminent, the Sulphur (of which there is a less quantity) cleaving to it, and intimately uniting, converts the Consistency of the Liquor from thin to thick, and as it were of an oily substance; and from an acid, sour tast to a very ingrateful and as it were musty.

It is probable that after the same manner the Blood is altered in the affection of the Scurvy, as Wines, as often as they become too hot, degenerate into fretted and ropy; for it is an argument, that this disease does not depend so much on the feculencies mixed with the Blood (though such should there be, they might be at last driven forth, and their supplies cut off) but on the habitual dyscrasie of the Blood; because the Scurvy being radicated, is so difficult and sometimes not at all, to be cured. Moreover we may affirm, the dyscrasie of the Blood which causes the Scurvy, to be two fold, as of the Wine, to wit, a sulphureous-saline and a saline-sulphureous disposition. For there are very great variety of affections, which are stirred up by the Scurvy; yet all of them may be aptly enough reduced to two principal Heads, or as it were two fountains of evil, to wit first, that the blood being touched with the scorbutick Miasm or Contagion, becomes either very fervid or hot, in which the Sulphur having dominion, associates it self powerfully with the Salt: wherefore it being made more rancid or fretting, grows inordinately hot in the vessels, and perpetually sends forth from it self adust recrements, to wit, concretions of Sulphur and Salt, and disperses them here and there, which spreading outwardly, produce spots, pimples, wheals, or ulcers: but being inwardly laid up, bring forth a disposition to Vomit, pains about the heart, Loosness, Fluxes and grievous pains. In this kind of Scorbutick rancidity or frettedness of the Blood temperate Remedies only are convenient, and often Blood-letting, Scurvigrass, Horse-radish, or other things endued with a sharpness and incitation: even by the like means as fretted Wines are cur'd, by discharging them from their *faces*, and by pouring into them, Milk, Flower, or Starch, Glew, or other Demulsions or Sweetnings, this is helped. Or in the second place, in blood nourishing the Scurvy, Salt has the chief dominion, and associates Sulphur to it self, wherefore it is not so fervid, but like ropy Wine becomes thick and mucilaginous, and is slowly circulated in the Vessels, and is apt to stuff the *Viscera* in its passage, and to affix there its feculencies as it were mud. Those affected after this manner, for the most without any pustulae or eruptions of the skin, become sluggish, breathless and feeble, and labour with spontaneous weakness and straitness of the Breast; and are found to be obnoxious to the passions of the Heart, the *Vertigo*, and Convulsions: In the scorbutick disposition of this kind, more hot Remedies, and such as are indued with a volatile Salt, yea Chalybeates or steel Medicines, which may fuse and agitate thorowly the Blood, are wont to be most used, and are to be handled even after the same way, as ropy Wines, to wit, to be soundly shaken and agitated; and also to them are put Lime, burnt Alum, Gypsum or Playsterring, Sea salt calcined, and the like, indued with an high acritude or sharpness. So much for the beginnings of the Scurvy radicated in the Mass of Blood: There yet remains to be unfolded, for what causes the Blood degenerating from its proper nature, conceives this or that morbidick disposition, bringing forth the Scurvy. But it first behoves us to shew by what means the seed of this Disease lye hid in the nervous Juice, the other general humour.

By what means
the scorbutick
Contagion is
impressed on the
nervous Juice.

We have elsewhere declared that from the Blood driven to the confines of the Brain, there doth distil a subtle Liquor, both for the matter and for the vehicle of the animal Spirits, and that it doth disperse it self every where thorow the *Encephalon*, and the nervous Stock: This *Latex*, so long as it is right and good, consists chiefly of Spirit and Salt combined or volatilised in it, and with these and the *modicum* of Water, wherewith they are washed, there seems to be little need of Sulphur and Earth: but yet this concretion of Spirit and volatile Salt doth indeed constitute the most pretious humour which penetrates, passes thorow, actuates, and irradiates all things, concerning which the Chymists have dreamt of their *Alchaeft*. At the beginning of the Scurvy, whilst

whilst the *Crafsis* of the Blood and the tone of the Brain are not thorowly vitiated, this watring liquor of the Brain and Nerves, being as yet spirituous, sweet, and not very unfit, performs all the functions to which it is destinated: but afterwards out of the bloody Mass made poor and very much weakned, a much thinner *Larix* and inclining towards Vinegar drops forth: and further, from the fœculent Blood and as it were rancid or fretted or ropy, heterogeneous Particles and very much infested are carried to the animal Regiment, and that being made weak within the Brain, they are admitted without repulse, and thence poured forth with the moistning Juice on its *Appendix*, both medullar and nervous: and from hence in several Regions of the flowing animal Spirits, sometimes faintings and wantings of strength, sometimes painful and spasmodick, or cramplike distractions, and explosions do follow. Wherefore a *Paralysis* or Palsy, *Convulsions*, *Vertigo* or turning round or giddiness in the head, tremblings and other preternatural Affections of the Brain and nervous Stock, are wont to fall on those who have the Scurvy deeply rooted: concerning which we will hereafter speak more particularly. In the mean time we will take notice in general, that the scorbutick Contagion affixed in the nervous Juice, consists in one of these three or in all of them together, *viz.* that the moistning of the Brain and Nerves becomes much thinner or poorer; or that it degenerates from its saline disposition into sourness; or that it is stult with heterogeneous Particles.

Hitherto we have shown after what manner the first seeds as it were of the scorbutick Affection are sown in the Blood, and from thence in the nervous Juice. Before we will consider of the fruits or symptoms of the Disease, excited by reason of the evil disposition of either of the humours and the reasons of them, and their manner of becoming so; we must inquire into the more remote causes and differences of the Disease it self: to wit, that it may appear from what causes or occasions, and by what provision the scorbutick disposition is impressed on the aforesaid humours.

CHAP. II.

Of the more Remote Causes of the Scurvy, by which its Contagion is affixed on the Mass of blood, and consequently on the nervous Juice.

HAVING shown in the former Chapter, what is the conjunct and nearest cause of the Scurvy, *viz.* the evil disposition impressed on the Blood and nervous Juice, it now remains, that we inquire into the more remote Causes, by which the Contagion of either humour, and chiefly of that which is chiefly and first in fault, is carried into the Blood: for the depravation of this being detected, it will easily appear, how the morbidick Miasm or Contagion is derived to the other Juice. Therefore as we have determined, that the scorbutick Affection is chiefly founded in the vitiated Blood, and that the evil of it consists, whilst the Spirit is depressed, in that the Salt and Sulphur, as in Wines becoming fretting and ropy, is unduely exalted; we will seriously consider, how this or that disposition is impressed in the mass of Blood.

But we ought not to pass over what other Authors, diligently searching after the nature of the Scurvy, have determined concerning its Causes and Subject. As there are many opinions of this thing, almost all agree in this respect, that the fountain and origine of this Disease is derived from the fault of the *Viscera*, and the seat of its product is placed in the bloody Mass, to wit, that this being almost only infected with their viciousness, contracts the scorbutick Contagion. The more Antient did impute the chief cause of this Disease to the Spleen, not rightly performing its office: but as the office of the Spleen was conceived this thing by some, another thing by others, and a different thing by these; they shewed the production of this Disease after a several manner. *Wierins*, *Echius*, *Albertus*, *Ronsens*, *Engalenus* with many others, supposing that the Spleen was the receptacle of the excrementitious melancholick Juice separated from the Blood, have determined the internal and next cause of the Scurvy, to be a plenty of lutulent or muddy humour, and of melancholly only, or also of that mixed with others, framing a peculiar form of corruption, which abounds about the Spleen and Liver, and in the Veins themselves. This opinion might deservedly challenge our assent, if it had pronounced the secretion of the melancholick Juice from the Spleen being neglected or hindered, to be sometimes and in part

The opinions of others concerning the original of the Scurvy recited.

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part the cause of the Scurvy ; but that this Disease is held to arise always and altogether from the default of the *Viscera*, is very highly improbable ; as will hereafter be made plain, when we shall declare the far more potent causes of the Scurvy. Other Authors attributing the office of sanguification to the Spleen, say that the Scurvy is produced, for that the Spleen does not turn that part of the Chyle destined to its self, into laudable Blood. But again others, as *Reusnerus*, &c. have thought the more humid and watry parts of the Chyle to be prepared in the Spleen, and to be converted into Blood. Therefore they judged the next and internal cause of the Scurvy to be the watry and serous humours, which not being received by the Spleen, were poured on the Blood, and so produced the original of the Scurvy. In the mean time others, as *Platerus*, *Baehnius*, &c. said that the thicker part of the Chyle being drawn by the Spleen, was the cause of sanguification, and by it too be prepared for it self, and other parts convenient Blood. From this supposition *Gregory Horstius* said the cause of the Scurvy to be the crude and ichorous Blood in the whole Body, but yet chiefly in the *Hypochondria*, offending not only in quantity but with a kind of specifick corruption, proceeding from the imbecility of the Spleen, viz. because thorow the preternatural Affection of the Spleen, the more crude parts of the Chyle, are not averted from the sanguification of the Liver, from whence the blood in the veins of the Liver and Spleen is first depraved, and then by the Commixtion of strange matter the Sanguification of the Liver is hindred, by reason of the object not rightly disposed, for as much as the chyle, by reason of the hurt of the Spleen, was not depurated in its just measure. *Horst. appen. ad. lib. 2 part. 2 Sect. 1 de Scorbuto*. This opinion easily falls to the Ground, because he asserts contrary to the Laws of Sanguification, the Spleen to sanguifie and to draw the more crude parts of the chyle to it self; when 'tis well known, there is no passage for the Chyle to the Spleen. Also this mistake is refelld by the opinion of *Reusnerus* and others, which affirm the next and internal cause of the Scurvy to be the serous and watry humours which the Spleen ought to draw, and by its peculiar office of Sanguification, to convert into Blood.

The most learned *Sennertus*, although with the former he attributes also the office of Sanguification to the Spleen, *Institut. lib. 1. cap. 9.* yet he derives the cause of the Scurvy otherways than from the fault of this *Viscus*. For he affirms, that by reason of the evil Concoction of the Chyle in the first passages, and being destitute of Spirit, salt and tartareous Feculencies to be heaped up, about the Mesentery and Cawl, and these being continually augmented by the approach of new matter, and moistened by the Serum, to be at last transferred into the Spleen and Liver, and from thence into the Stock of the veins, and so in them to infect the whole bloody Mass, and to render it crude and salt. He calls this first Mine of the Scurvy, gathered together in the first passages, a melancholly Humour ; which besides he says to be serous, stopped up with pituitous humours, and by reason of its stay in those parts, corrupted after a peculiar manner : Then he adds, that this humour is generated by the fixion of the Spirit and volatile Salt, after the same manner, when as wine changes into Vinegar.

The Scurvy does not always arise by the fault of the Spleen or the first passages.

Several Reasons of no small moment do convince me, that I cannot in all things assent to this opinion ; however probable it seems. For besides, that this Doctrine does not exactly quadrate with the Circulation of the Blood, since by its Law the humours in the mesaraic vessels are scarcely gathered together apart from the other kind of Vessels, at least there is not any passage for them from thence into the Spleen, moreover it is not rightly determined, that the Scurvy begins only in the first passages ; for sometimes it is contracted by mere Contagion. Neither also do we think that this Disease proceeds from the fixedness of the Salt, or from the Crudity of the Blood and humours : for oftentimes it succeeds to long continued Fevers, and that rather seems to proceed from adustion and too great desiccation of the Blood, than from any advection of the Chyle and other humours in the first passages : moreover sometimes a Sea and marish air induces this Disease, though no Crudities are begotten about the *Viscera* : and the sick do not complain from the beginning, of their Appetite and Digestion. Indeed wee grant, as to what belongs to the Crudity and the fixity of the Salt, in the Chyme (or second digestion) or the Blood, and defect of Spirit, that from these causes a sickly Disposition is oftentimes produced, but not therefore presently the Scurvy, but rather the *Malacia* of longing women, *Pica* of Virgins, the phlegmatick Dropsie, or some other dropical disposition succeed. Therefore since the Scorbatick Ætiology hath been delivered by Authors, to whom the Circulation of the Blood was not known, and agrees less with the Truth, we will open the whole matter with that Key, and to the best of our Skill more accurately unfold the causes

ses, both procatartick and evident, of this Disease, according to the Law of Sanguification.

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We have already hinted that there are many occasions and procatartick means from which the Scurvy seems to deduce its original. 1. In some places it becomes national or peculiar, so that the morbidick Contagion is drawn in together with the vital Spirit, by reason of the evil Influence of the Air, and of the vapours, wherewith it is stuffed. 2. Very often this Disease follows upon long continued fevers, and other Chronical Diseases, and is very deservedly accounted the effects or products of them. 3. Sometimes it is hereditary, and is propagated by tradition from Scorbutick Parents. 4. Sometimes again it is taken by mere Contagion. 5. An evil manner of living, inordinations as to the things non-natural, an innate or acquired Dyscrasie of the *Viscera* sometimes induce a Scorbutick affection, more often contribute to its birth, or nourish the inkindling. We will consider the reasons of every one of these effects.

1. There is none of the ordinary sort of People, but confesses that the Scurvy is very often contracted by the fault of the Air, and it is almost in every bodies mouth, that places near the sea side, marsh lakes, and moist places, render the Dwellers obnoxious to intermitting Fevers, or the Scurvy: wherefore the sickly, or such who have any regard to their health, do choose their habitations far from such kind of places. Indeed such an humid Air, continually diffusing filthy exhalations and infection, becomes unwholesome in a double respect, and often brings forth the Scurvy, viz. by reason of Transpiration being hindred: and because of the susception of an incongruous Ferment. For in the first place, people dwelling in a thick and not purified Air, have the Passages and Pores of their skin much closer, or shut up: wherefore when the *Effluvia* of the Blood are not duly exhaled, but the same retained within, ferments the rest of the bloody Mass, and disposes its active particles to various inordinations. Then in the second place, for as much as at the same time filthy vapours, stinking, incongruous Salt and Sulphurs are sucked in, by reason that the Spirits of the Blood are greatly depressed; and in the mean time its sulphurous and saline particles are carried forth to the extremity, and from thence the *Crisis* of the sanguineous Mass being by degrees chang'd, it degenerates into an evil disposition. And indeed, the sulphureous part of which being exalted by it self induces a notable rancour to the Blood; and there is wont to be excited, sometimes continual, but often intermitting fevers so familiar, by the unwholsome air, for the reasons elsewhere shewed. If from such an occasion (as it very often happens) the saline Principle is carried forth together with the Sulphur, such a scorbutick disposition as we have above described, like to fretted or ropy Wine is impressed on the Blood. Not only a great tract of humid and vaporious Air, is unwholsome after this manner, but also to dwell in houses situate near any marsh, or encompassed about with a pond or moat, or in houses new plastered with lime, renders persons obnoxious to this Disease.

By what means
unhealthful
Air breeds the
Scurvy.

2. A Fever of long continuance, very often induces the Scurvy: the reason of which manifestly appears from our *hypothesis*; for from the often, and too much deflagration of the Blood, the Spirits are very much wasted, and like liquor that becomes poor and liveless; by its burning, a great plenty of the more pure Sulphur evaporates, and in the mean time what is left of it, associating to it self the Salt, carrying it up, is wont to cause the *Crisis* of the Blood to become plainly morbid and scorbutick. It is to be observed, after a long Fever, by reason of the Spirit and Sulphurs too much exhaling, and very much of the Salt being for a long time concocted with the remaining Sulphurs, that the Blood becomes very salt, and as it were lixivial, so indeed that from thence, it is scarcely enough inkindled in the heart to perform the circulation: such a disposition of the Blood is not to be restored, but by a long time, and is very difficultly hindred from running into the Scurvy. Not only after fevers, but also after other chronical diseases, evilly cured, the Scurvy is induced; and that for a double reason or means of affecting, to wit, either because the Blood is changed by the present disease towards a scorbutick disposition, or because the disease hinders the sick for a great while, from any exercise, or motion, and from thence they are inclined, by a long Idleness and sitting still, to the Scurvy. The first is discerned in Melancholly, when by the depression of the Spirit, and the Salt being carried out into a *fluor*, the Blood turns to a Sourness. This kind of *Crisis*, the Sulphur afterwards associating with the Salt, and both of them being carried forth easily passes into the Scurvy. The Hypochondriack Affection is so much of kin to the Scurvy, that it very often takes it for a Companion: for the melancholly feculencies, which only alter the nature of that affect pollutes the Blood, afterwards perverts its *Crisis*, and renders its scorbutick: in like manner the Jaundice and Dropie which at first only infects the Blood by an impure and incongruous Mixture, after a long stay

2. why it follows
upon long fe-
vers.

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stay, quite changes its Temperament. 2. Many other Diseases accidentally induce the Scurvy for as much as the sick are hindered from any kind of Labour or Exercise; so that their blood is very little eventilated, but retained, like Wine a long time upon its lees, looses its *Crafsis* or Temperament, and is liable to the inordinations of the Salt, and Sulphur. After this manner the Palsie, *Lumbago*, or feebleness of the Loins, the fracture of Bones, Ulcers, Wounds long time in curing render Men obnoxious to the Scurvy.

3. How it is
contracted by
Succession.

3. The Scurvy is sometimes contracted by succession, so as the contagion of the Disease being derived to Children from their Parents, without any other external or internal causes, produces infected fruits exactly like the nature of the scorbutick Affection: So have I known Children sprung from sickly Parents, to have been affected with wandering pains in their Limbs, an eruption of Spots, an erosion and rottenness of the Gums and Teeth. Besides it is observed, the Children of Parents touched with the venereal Disease, to be obnoxious to most grievous symptoms, like to scorbutick Affection. The reason of these sorts of affections seems to consist in this, for that the filthy taint being impressed on the genital humour, becomes like empysoned ferment, which although it for a long time lies hid, being involved with other Particles, at last exerts its power and raises up the symbolick Elements of Sulphur and Salt in the Blood or nervous Juice, and by carrying them above the rest of the Particles, inclines to the scorbutick taint.

How by Contagion.

4. By the same reason and means of affecting, the Scurvy is propagated by contagion, viz. the Effluvia's proceeding from an infected Body, and entering into the Pores of one that is near or inspired by the Breath, ferment either the Blood or the nervous Juice, or both of them together: and so by carrying up the spirituous-saline, and sulphureous Particles, pervert the Temperament or *Crafsis* of the Liquor, according to their nature.

How the Viscera and the first ways are in fault.

5. The causes of the Scurvy hitherto cited, respect more immediately the bloody Mass, and shew the disease to begin from its *latex*, without any great fault in the first passages. But lest we should think this Region, to which some attribute all the fault; to be wholly free; it seems to be determined according to the judgment of others, that the rudiments of the Scurvy is also sometimes conceived within the *Viscera* of Concoction, and from thence traduced into the Blood: For when it happens from the Chyle, being for a long time vitiated, that the nutritious Juice becomes incongruous, and is stuffed with Particles of enormous Salts and Sulphurs, which it carries to the bloody Mass; there is a necessity that its *Crafsis* will at length be changed, & perverted according to the nature of the matter, by which it is constantly & daily supplied. Wherefore it is observed, that those who eat much of salt or smoke-dry'd Meats, and drink much Wine and strong Waters, by which means Salt and sulphureous Particles are violently carried into the Blood, are found to be very much obnoxious to the Scurvy: Besides those who feed much on Swines flesh or Fish, although fresh, but especially on Shell-fish, for that these Aliments have in them plenty of rank Sulphur and Salt (as may be gathered by the extreme stink of their putrefaction) are very apt to fall into the Scurvy, and which is more, sometimes into the Leprosie. On the contrary, they are not so incident to this Disease, who eat milk meats, raw and unripe fruits, fresh Cheese and other absurd things, which heap up in the Ventricle a great quantity of Phlegm; neither is the Juice nourishing the Scurvy, produced from depraved or ill digested meats; but sometimes Aliments fit or convenient enough turn into a morbidick matter by the fault of the *Viscera*; which indeed happens not always by the fault of the Liver or Spleen, as some have thought, for these have no business with the Chyle, but the Stomach it self being endued with an extraneous ferment, perverts every thing that is put into it, and changes it sometimes into a sour, sometimes into a Salt or vitriolick pulp, and it is very likely also that the incongruous Juice from the Pancrease, or the cholidical passage, may be mixed with the Chyle, and imbue it with an heterogeneous tincture. We do not deny but that the Spleen and the Liver do not seldom contribute to the production of the Scurvy, but yet not the Chyle but more immediately the Blood suffers for their faults when the Liver is obstructed; so that the adust recrements of the Blood are but little or small separated, by reason that its Mass being more feculent, becomes too luxuriant with the particles of Salt and Sulphur concocted together. As to what relates to the Spleen, it is not altogether undeservedly, that so many complaints are exhibited against it, as to the production of the Scurvy: For as the office of this Bowel (as we have before shewn) consists in this, that it doth receive and separate both the atrabilary or melancholly feculencies of the Blood, which consist in a fixed Salt and Earth, and also that it digests the same by a further concoction into a ferment, to be mingled again with the Blood: If then at any time the Spleen does not rightly perform

form these its Offices, the mass of Blood is wont to be infected in a double respect : P H A R.
to wit, either because the atrabiliary or melancholly faculencies are not wholly received Part. II.
by the Spleen being obstructed or debilitated ; or because being received, the same are perverted into an unfitting and corruptive ferment of the Blood : After this manner and sometimes after that, the sanguinous Mass becomes evilly disposed, and not rarely by this only occasion, or by the accession of other causes, degenerates into a scorbutick disposition : And indeed from such a foregoing cause, we have formerly declared the hypocondriack affection to arise, to which truly the Scurvy (as even now we hinted) is so near a kin, that it most often is a companion with it, or follows hard after it. But it plainly appears by the observation before cited, that the Scurvy does not always and only arise from the fault of the Spleen : For some time past there was a noble Gentleman, who for many years had laboured under a scorbutick affection, accompanied with very many and grievously horrid Symptoms ; The Physicians whilst they had this Gentleman in cure, concluded his sickness to be contracted by the fault of the Spleen ; and all those heavy evils to come upon him for the sake of that Bowel : At last after being afflicted almost with continual pains, for the space of ten years, and also with the *Paralysis* and miserable Convulsions, wasting away, he died with a Consumption. The Corps being opened, it appeared to the sense, that the Spleen so evilly defamed was free from all fault ; for this inward was very laudable in figure, magnitude, substance, and colour, and without any tumour or obstruction : Besides, the sanguiferous Vessels being opened and freed from their stuffings, the nervous Fibres appear'd firm enough, and the Blood contained within the pores of the Spleen, free from corruption.

Among the causes of the Scurvy, that are wont to be derived from the inordination of the *non-naturals*, we may here deservedly place sadness, for it is every where observed, that men, through some occasion struck with sorrow, and so remaining for a long time sad, do become scorbutick. The reason of which seems to be this, great sadness immediately affecting the inferior or bodily Soul, compells inwardly both its parts, to wit, the sensitive and the vital, straitens their *Systases* or constitutions, inhibiting their wonted expansions, and draws them into a lesser space. Hence the Animal Spirits being hindred from their due expansion, remit their Oeconomy, wherefore the Blood repeating its Circuits in a lesser compass, is apt to be heaped up about the bosom of the heart, and there to stagnate for this reason, when the Spirits of either Government, *viz.* either animal or vital are depressed, and the Blood and nervous Juice begin to be altered in their complexions, either of them by degrees losing their vigor, turns from a generous Liquor to one sour and lifeless : Besides, the *Viscera* of Concoction being denyed the wonted influx of Spirits, perform very untowardly their Offices. Hence from the Chyle not rightly concocted, or being depraved in its coction, the nutritious Juice being stuffed with faculencies, becomes vitious ; and is poured on the bloody Mass, whereby it more perverts its *Crisis*, and causes it easily to pass into a scorbutick disposition. Moreover for this reason, immoderate and too serious studies, and the continual intention of the mind, for as much as from hence the Spirits being depressed, and the offices of the *Viscera* subverted, the chief *Crisis* of the humours altered for the worse, they often acquire a scorbutick taint : To which we may add, that both sad and studious persons, for the most part lead a solitary life ; for which cause, both the Blood and nervous Juice, as water wanting motion contracts mud, is wont to be vitiated and ready to fall into a scorbutick corruption.

These are, if not all the procatartick or more remote causes of the Scurvy, yet at least the chief of them which affix its taint on the Blood ; there will not need any other *Ætiologie*, to shew how it is derived from the hurtful Blood into the nervous Juice, for the Blood by its accustomed rite and law of circulation, distills a portion of its spirituous Liquor into the Brain : But as we have before shewn, from the Blood depauperated a thin *laxer*, and from that a sharp liquor and salt withal, is drawn off after the manner of salts when they are distilled : Also besides from the feculent Blood, and as it were, muddy heterogeneous Particles, infesting the animal Kingdom, are brought forth ; which notwithstanding are not easily admitted into a firm and sound Brain. Wherefore as such Particles, being received within the *Encephalon*, do induce thereupon paralytic affections or Cramps ; some causes precede, by which the constitution of the Brain is debilitated, of which sort they use to be, 1. Its evil hereditary Disposition. 2. Frequent Surfeits or eating too much, immoderate drinking of Wine, noon Sleeps, great Hæmorrhagies, and other occasions, whereby either the animal Spirits are too much consumed, or the pores and passages of the Brain, relaxed, and too much opened, that they admit of every thing brought from without.

wherefore sadness and immoderate Studies beget the Scurvy.

The scorbutick taint is derived from the Blood to the Brain and nervous stock.

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CHAP. III.

Of the differences of the Scurvy, also of the Signs, Symptoms, and Causes of this Disease, and chiefly of those which arise by reason of the taint being impressed on the Blood.

The differences of the Scurvy.

FROM the causes of the Scurvy hitherto described, it will be easie to assign the differences of this Disease : For in the first place, this affection may be distinguished according to the twofold Region of the conjunct Cause, *viz.* the Blood and the nervous Liquor, for that it is either of this or that Kingdom chiefly, and is more deeply rooted now in the Blood, now in the nervous Juice. Secondly, according to the double taint of the Blood affected, to wit, as that shall be either sulphureous-saline, or saline-sulphureous, it shall also signifie the Scurvy by divers Names, or it shall be called according to the vulgar appellations, either, bilous or hotter, shewing it self in spots or wheiks, and other more apparent symptoms ; or Melancholly, whose poyson lying hid, as it were covered with ashes ; is known rather by the intrinick hurt of the faculties, than by outward eruptions. Thirdly according to the Original & manner of invasion of the Disease, to wit, for as much as it is received either by contagion, or that it arises through an internal *procatarxis* or remote cause ; also according to its various state, it is many ways distinguished, and is either beginning, more perfect, or desperate, and requires a divers manner of Indications as to the Cure, of which we shall treat more largely hereafter. In the mean time, it is our business to recite the signs and symptoms of the Scurvy, and to add the causes of them, and after what manner they happen.

Signs and Symptoms.

The Signs by which Prognosticks or *Indicia* of the Scurvy are taken, are either extrinick, to wit, certain accidents and circumstances, which till the more certain notes of the Disease appear, give a suspicion of it : So we may deservedly think, any one having a very sickly disposition, to have contracted some taint of the Scurvy, if he be sprung from scorbutick Parents, or if he have long conversed with a Wife, or Companions affected with it, or if he live near the Sea Coast or marshy or otherways unwholesom places, or if he should have had before a long Fever or other Chronical Diseases, or if he shall be sensible of help by anti-scorbutick Remedies, and that such ill disposition be without a Fever, or certain signs of any other Disease. Or Secondly, the signs of this Disease are present affects and symptoms, to wit, inherent to the sick body ; which sort as they are manifold, are wont to be variously distributed, & reduced into certain Classes, that is to say, for as much as they are proper to the Scurvy, or common to it, with other diseases, also for that they are excited, either about the beginning or in the increase of the Disease, or in its worst state or condition. Further, they are distinguished according as they shall be excited in the various parts of the Body internal or external, also for as much as they may happen either in the Head, Breast, the *Abdomen*, or about the Members or habit of the Body : By this way we have already recounted the scorbutical symptoms. But they may be aptly enough distributed according as they arise, either by reason of their taint, being fixed chiefly in the Blood, or by reason of the faults of the nervous Juice, or by reason of the congression, or as it were conjunct influences of either humour becoming enormous. We shall as much as we can, insist on this method, in reciting and unfolding the signs and symptoms of the Scurvy, although in the mean time, very many affections which seem to proceed from the singular fault of this or that humour, procure some fault of the other humour, to be also a part of the cause : As to what relates to the preternatural affections of the first passages, and the *Viscera* in the Scurvy, although they sometimes proceed from errors in living, yet most often the sicknesses of these parts becoming indeed permanent arise by reason of the Blood or nervous Juice, as shall be declared hereafter in its proper place. In the mean time, we will shew at once how the chief symptoms of the Scurvy proceed from the fault of this or that humour, or conjunctly from both.

1. What kind of Affections arise by reason of the scorbutick Dyscrasie of the Blood.

1. When as the Blood is very much infected with a scorbutick taint, evil symptoms follow for three chief Reasons, *viz.* 1. Because its Liquor being depauperated, wants its wonted vigor ; so that it can neither be inkindled in the heart freely, nor be circulated lively and equally : For which Reason, a dejection, and as it were a falling down of the whole Soul, Sadness, Anxiety, difficultnes of Breathing, a straitness of the Breast, intermitting Pulse, frequent Swoonings, and inordinate suffusions of Heat and Cold follow. 2. The Blood abounding with feculencies, pours all about its Recrements on the parts which it washes ; Wherefore Spots outwardly, Pimples, VVheiks, Pustles and Ulsters are excited.

excited. Hence also, Catarrhs, the Dropsie, a swelling of the Members, Ulcers of the Gums, Vomitings, Lasks, Fluxes, great Spittings, Sweats, a lixivial Urine, or filled with Contents, as also tumors of the *Viscera*, or obstructions do not seldom follow. 3. A poor and feculent Blood supplies the Brain and nervous stock with but a vicious Liquor; and so by the means of those Parts it communicates its faults: Besides a depraved Blood does not afford presently a *Copula* or joyniting to the Spirits, every where abounding within the Fibres, convenient enough explosive for the acts of the locomotive faculty, from whence a spontaneous lassitude, or weariness, and impotency to the moving of the parts proceed.

2. In the Scurvy, the moistning juice of the Brain and nervous stock, after it is infected with the filthy taint, offends in a treble respect. 1. For as much as it declines from a noble and spirituous, into a poor and thin Juice, from whence a languor and enervation of the whole Body, and in some part also an Atrophy proceeds. 2. For as much as this Liquor is changed from a spirituous-saline, into a sour, acetous Juice, from whence melancholly and fear, a failing of Spirits, and a suppression from their wonted vigor, and also almost continual griefs and irritations of the nervous parts, and a crackling of the Bones are induced. 3. For that this Liquor is stuffed with heterogeneous Particles, and infesting the animal Regimen; Convulsions, Spasms, or Cramps, Palsies, Vertigo's, soporiferous Affections, or pertinacious Watchings, at last Foolishness, or Moping, or Madness arise.

3. In a more heavy and inveterate Scurvy, the recrements of the Blood and nervous juice, being deposited together in divers parts, for as much as they are endued with saline Particles, which are of a divers nature, they encounter one with another; and by a mutual striving and effervescency, produce most horrible Symptoms. From hence arise intollerable dolors, chiefly at night, wandering pains in the Joynts, Rheumatisms, and other affections of this kind. After this manner, from the double fountain of the scorbutick taint, very many Rivulets of evil affections running every where in all parts of the whole Body, create griefs.

4. That yet a more full knowledge may appear, it will not be from the matter, to recount each of the aforesaid Symptoms, and the reasons of every one of them, and how they come to pass particularly to deliver.

1. The first sign of the Scurvy, by which oftentimes a suspicion of the beginning of this Disease is given, is a spontaneous weariness, to which are added impotencies as to motion, also a debility of the Thighs, and as it were a sense of weight or heaviness. These Symptoms are wont to arise about the beginning of this Disease, and are derived rather from the fault of the Blood, than of the nervous Liquor, which is as yet scarcely infected: But this may be done in a double respect, viz. in the first place, for as much as the Blood being made impure, flings out serous feculencies in its circulation, and insinuates them into the pores and passages of the Muscles, wherewith they are stuffed and loaden, so that the Spirits being hindered and intercepted, they perform not freely enough nor lively their locomotive explosions: Besides, the parts being loaded as it were with a certain Burthen, they are not easily and readily moved as formerly. 2. From a vicious Blood, the explosive *Copula* of the animal Spirit becomes degenerate and weak, wherefore they neither readily accomplish, or nimbly perform the local motions: We believe in an inveterate Scurvy the impotency, as to motion to arise also from depravation of the nervous juice, and from the want of Spirits.

2. Difficult breathing and a shortness of breath upon any motion, is a familiar symptom of the Scurvy, of which as there are wont to be two causes, it depends now upon one now upon the other, and sometimes on both together. The scorbutick *Dyspnœa* or shortness of breath, if it be very frequent and almost constant, comes from the very poor, and as it were, liveless state of the Blood, whereby it is indeed apt to stagnate, and not to be easily inkindled in the Heart: wherefore from any motion, as the Muscles urge the sanguiferous Vessels, by compressing every where their contained liquor, the Blood rushes somewhat more plentifully into the bosom of the heart, which when it is not there presently inkindled, and carried forth of doors, it lies heavy at the heart, and threatens a decay of the vital function: Therefore the Lungs that they may bring help, are moved more swiftly, that the Blood may be drawn forth quickly, and so for this end, to wit, the circulation of the liveless Blood, and of it self almost immoveable, the often and short breathing is caused. In this case, with laborious breathing there is also a quick and small Pulse. 2. Sometimes the scorbutick *Dispnœa* or short breathing proceeds from the fault of the nervous stock, for after the morbid or filthy taint has occupied the Brain and its appendices, the heterogeneous Particles sent from the *Encephalon*, as they are of kin to other nerves; so also to other Spirits, to wit, those serving to the motion of the *Diaphragma*, and the Muscles of the Breast, come to the Brain; and so according as those Nerves are either inhibited or perverted from performing rightly their offices, a difficult respiration,

Difficult of Breathing.

The cause of the Symptoms unfolded. Spontaneous weariness.

2. How impressed on the Brain and nervous Juice by reason of the taint.

3. How by reason of the Conjunction of either humour.

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is produced of a various kind, and is for the most part either Paralytick or Convulsive: For the morbidick Particles entering into the nervous stock, and about their foldings or extremities being more plentifully heaped up, are fixed with plenty of Spirits. Hence it sometimes happens from such a cohesion of Particles, (if perhaps they be Narcotick) that the Spirits inhabiting those Nerves, are every where bound and hindered from their designed actions: When respiration being hindered, other Spirits the guests of Nerves yet free, that they may perform the common task by their own strength, are very much stirred up, and so as much as they may, they cause a more frequent and laborious respiration. But whenever the Spirits flowing within certain Nerves, for the office of respiration are affected with an heterogeneous, explosive, or spasmodick *Copula* or joyning of the ends of the Muscles, for the sake of whose pressing out, when they are excited through plenitude or for other occasions, they run into convulsive motions: And from thence the Lungs are detained with laborious and often repeated turns, now of *Systoles* now of *Diastoles*, like to asthmatick Paroxysms. In these cases, sometimes the Nerves of the *Diaphragma*, sometimes the Pneumonick, and those absolving the motion of the Breast, also sometimes perhaps those embracing the *Bronchia*, sometimes these, sometimes those apart from the rest, are stupefied or obnoxious to cramplike affections, and for that reason the various differences and ways of the anomalous or unequal respiration occur: Some kinds and examples of which we may add hereafter. I know some ascribe the causes of the aforesaid Symptoms to the Vapours elevated from the Ventricle and its Neighbourhood, whose opinion in another place we have deservedly rejected, with reasons shewn to the contrary. *Eugalenus*, *Horstius*, and *Sennertus*, whom others follow, deduce the cause of the scorbutick *Dyspnœa* or purliness, from the *Viscera* of the lower belly, being inflated or tumefied, and by that means pressing the Cawl, as it uses to come to pass in Hydropicks, and women big with Child. But I cannot assent to this opinion, because this symptom does not seldom happen to those, whose Belly and *Hypochondria*, are soft enough, and who have the sinking below the Ribs, and the space for the motion of the *Diaphragma*, free enough, as I have often found upon examination. But, that difficult respiration falls upon Hypochondriacks, & sometimes also upon Scorbuticks, upon the perturbation of the Spleen, the reason is, because the Splenick Nerves communicate with the pneumonick: Therefore indeed when either of them are beset with the morbid, *viz.* the spasmodick matter, and the same being moved in either of them, stirring up Cramps; draws the others into a consent of affection, as I have already manifestly declared, discoursing of the hypochondriack passions: In all difficult respiration excited by reason of the fault of the nervous stock, the Pulse though for the most part strong enough, yet becomes quicker than it ought to be, and sometimes intermitting.

A straitness of
the Breast.

A straitness of the Breast heavily infests some scorbutick persons, which kind of symptom hath joyned with it a difficult respiration, and commonly is ascribed to the same Cause, to wit, from the compression of the Caul by the elevated *Viscera*. But yet though the Breast be sometimes by that means straitned, that those purely affected can hardly draw their breath, but that the taking in of the breath terminates in the midst of the *Thorax*, yet sometimes on the contrary, they draw in the Breath too deeply, so that they breath it out again hardly and difficultly: which certainly by no means ought to be attributed to the inequalities of the inferior *Viscera* in the *Diaphragma*; but either to the undue accension of the Blood in the Heart, or rather to the preternatural affection of the Nerves, serving for respiration: By the like reason also the cause of more difficult inspiration or taking in the Breath, is deduced from the same fountain, *viz.* in either case the Nerves serving for the drawing in and thrusting out the Breath, for that they are possessed with a morbidick matter, and that either Narcotick or Spasmodick, they perform in the executing their proper Offices either more or less than they need to do. But sometimes scorbutick Persons are troubled with a straitness of Breast, without the breathing much hindered; so that they feel the compass of the *Thorax* to be more strictly drawn together, and to be contracted into a narrower space. In the mean time, those so affected complain rather of the anxiety of the heart, than of any hindrance of the motion of the Lungs: The cause of this seems to be, that the Membranes investing the *Præcordia*, for as much as being too much irrigated with a serous humour, together with the nervous, become more contracted like wet Leather: So that their Fibres being irritated, wrinkle themselves too much into short Convulsions or Spasms, and from thence they force the containing parts to be straitned: Besides, this kind of straitning of the *Præcordia*, follows in some part the motion of the Heart it self: For whilst the Blood is made poorer, it does not leap forth strongly enough from the bosom of the Heart, nor flames out openly into the Lungs. Wherefore these need the less to be dilated or expanded, but rather that they may answer to the circulation of the Blood, performed in a lesser compass, and exactly quadrate to the investing Membranes, & to the nervous Fibres destined to their motion they are regulated

ted according to the weak limits of expansions : Wherefore this constriction of the *Præcordia*, as I have observed in very many, is wont to be suddenly remitted and intended, by reason of the occasions of Joy and Sadness, even as the Blood leaps out more plentifully, or more sparingly from the bosom of the Heart, the greater or the lesser space is proportionated to its Circulation.

4. An unequal and an intermitting Pulse, also frequent swoonings and fear of the same, very often happen in the more grievous Scurvy, the same reason of which as of unequal breathing, is ascribed deservedly, now to the undue accension of the blood in the Heart, and now to the inordination of the nervous stock. The Blood being made more saltish, and besides much stuffed with scorbutick feculencies, is but unequally and brokenly kindled, like the oyl of a Lamp imbued with Salt and muddy filth. Wherefore from hence an irregular Pulse, with a wasting of the vital spirits in the Brain is stirred up. Moreover, when the cardiack Nerves are also beset round with a morbid matter, so that the influx of the animal Spirits, by which the motion of the heart is continued, is not performed in a just dimension and equal manner, by that means it happens that the motion of the heart is somewhat hindered, and its reciprocations variously disturbed; an unequal or intermitting Pulse, and a small & weak seems to proceed from the dyscrasie of the Blood, but if it be great and strong enough, from the fault of the animal function.

Inordinate
Pulse.

5. The trembling palpitation and great leaping of the heart often happen to those scorbutically affected; these sort of passions are merely convulsive, and altogether depend on the cardiack Nerves, to wit, belonging to the heart it self or *Pericardium*, beset with a spasmodick and explosive matter. For the animal Spirits, the inmates of the Nerves themselves and of the Fibres, and their appendices being inordinately explosive, compel the whole joynting of the heart to be cruelly shaken and moved. In the mean time, whilst the whole bulk of the heart is agitated by that means, it does often rightly perform the proper motions of *Systole* & *Diastole*, as I have observed in many, who with such a shaking of the heart have had an ordinary and laudable Pulse.

The Passions of
the heart.

6. Erratick Fevers, also sudden suffusions of heat & cold in several parts of the Body, use to come upon an inveterate Scurvy: The reason of the former is, because the extraneous matter being often carried to the Blood with the nutritious Juice, for that also the alible Juice it self is made degenerate, because it is not rightly mixed with the Blood, they stir up its extemporany effervescencies. In the mean time, a Fever observing a regular type, for that cause excited, rarely happens to Scorbuticks, because the saluginous Blood, although it be taken with a feverish burning, does not burn long nor much, at least not equally: As to the sudden suffusions of heat and cold, they indeed seem to be inferred somewhat by reason of the affection of the nervous stock, for that the Nerves and Branches and nervous succours, do diversly embrace & compass about the sanguiferous Vessels in most parts of the Body, perhaps for that use, that the course of the Blood might be urged & restrained, as it were with Goads and Bridles, according to the force of the passions, and other exigencies of Nature: it is very likely that when the œconomy of the animal Kingdom is perverted by the scorbutick taint, that most of the Nerves and Fibres and their Appendices, being stretched out here and there, do every where run into spasms or convulsive motions, and also by reason of their hurt, the irregularity of the Arteries and Veins are contracted: So that the Blood is compelled into these parts more than it ought, and is too much estranged from them, from whence these kind of inordinations of heat and cold proceed.

Wandering
Fevrs.

7. Plentiful Sweats chiefly at night, are wont to be very troublesome to some scorbuticks, the reason of which is, that as the nutritious Juice being daily brought into the mass of Blood, by reason of the dyscrasie or evil disposition of this, and the impurity and filth of that, is not assimilated, but being rejected of the Blood is sent away under the form of Sweat. But that the nutritious Juice in the time of its assimilating, becoming degenerate, does not produce an intermitting Fever after its manner, the cause is the saluginous intemperature of the Blood, which therefore becomes less able for periodick desagrations; this sort of immoderate sweating happens chiefly in the Scurvy, following upon a long Fever or other Chronical Dyscrasies, where the nutritious Liquor is perverted, rather by the default of the assimilating Blood, than of the concocting *Viscera*.

Nightly Sweats

8. In a more certain Scurvy, as in other Diseases, we consult the Urinal: For if the Urine appears intensely red, and as it were lixivial without a Fever or the Jaundise, we undoubtedly pronounce this a sign of that Disease: For whilst the serous *Latex* is circulated for some time with the soluted Salt, and Sulphur, the saline and sulphureous Particles being concocted in the same, bestow on it a very deep and as it were lixivial tincture: Also that such Urine abounds very much with contents, which, the stale being cold, precipitate to the bottom, it altogether owes it to the Particles of the degenerate nutritious Juice snatched away with the *Serum*. But yet the Urines of the scorbutick persons often vary,

Lixivial u-
rine.

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A plentiful spit-
ting and ulce-
rous Affections
of the Mouth.

vary, for sometimes they appear of a Citron colour, with a Cream swimming in it or fixed to the sides of the Glass, from whence an *indiciu*m is taken, that the Blood doth abound with saline rather than sulphureous Particles: Indeed if such an Urine be exhaled at the fire, the saline residue will remain in almost the double quantity of the Liquor. Moreover, sometimes the Urines of the Sick are changed from this or that state to the contrary, so that what was to day red or of a Citron colour, to morrow is made limpid, clear, and thin, and in abundance: Which kind of Piss, as it appears, was not circulated long with the Blood (because it hath received no tincture from it) we judge to come to pass from the watry recrements of the Blood and nervous juice, contained partly within the Lymphæducts, and partly deposited within the Pores and passages of the solid parts, which when they are gathered together to a fulness, every where run forth of their Receptacles with the rising flood, and rushing into the bloody Mass, are from thence sent away presently by the Reins.

9. There follows upon this Disease being grown very grievous, a plentiful spitting, and for the most part a bloodiness of the Gums, and then a looseness of them, and at length a putrefaction, which is wont to be accompanied with an Erosion, Looseness, or falling out of the Teeth, and with a stinking Breath: That the reason of which may the better appear, in the first place, you are to be advertised, that there are ordained about the peculiar parts of the mouth, certain Pipes or passages, to wit, salival, by which the serous humours are plentifully sent forth: These arising from various Glandula's, to wit, the *Parotides* being in the Wefand or Throat, the Maxillar for those belonging to the Jaws, and those under the Tongue for the most part terminate about the Gums or near them: The constant and ordinary Office of these, is to lay up the Spittle for some necessary uses in the Cavity of the mouth. Besides, it is observed that the superfluous humours, yea the more thick and vicious are perhaps sent away forth adooors by this way, rather than separated from the Blood as by Urine, Sweat, and otherways. Quicksilver prepared with Salts and taken inwardly, or the Body anointed with it, is minutely dissolved by the saline Particles of our Body, and being with them involved, mixes it self most deeply: These kind of Concretions of Salts and Mercury, being diffused thorow all the humours, and into all the parts of the whole Body, as Nature endeavours to expel the trouble they afford; the best indeed and most easily performs their execution by these emunctories of the Mouth: For the Blood, and perhaps in some part the nervous Liquor being burthened with those mercurial-saline Recrements, endeavour by every way to shake them off; which however, when they are more thick and fixed, than that they can be exhaled or distilled forth by sweat, or sent away, being precipitated by the ferment of the Reins through the Urine; they are sometimes breaking thorow the little mouths of the Arteries, inserted in the Intestines, in some part excluded by the Belly: But yet the particles of this Medicine being involved with the *Serum*, and most readily deposited in the afore-said Glandula's, and in others belonging to the Mouth and Throat, flow out by salivation more plentifully excited; by which effluxion it happens that the Gums and other parts of the Mouth are ulcerated, and the Teeth are loosened with a stinking of the Mouth. But this kind of salivation sometimes succeeds of its own accord, instead of a *Crisis* without *Mercury*, in the declination of ill judged Fevers, and the humour to be excerned, sweating forth not only from the more open holes of the salival passages, but also from the little mouths of the Arteries every where thick planted, daub over the Cavity of the Mouth with a whitish scurf. The like reason of these accidents, may be rendred of these sort of Symptoms in the Scurvy: For indeed when in a depraved Blood, more and thicker recrements of the enormous Salt and Sulphur are gathered together than can be excerned by evaporation or by Urine or Siege, they are carried to the emunctories of the Mouth; by which the more salt purgaments of the Blood are wont to go forth: these salt things being diluted with the *Serum*, sweating not only from the salival Vessels, create great spitting; but also being carried thorow the Arteries, enter into the soft and spongy flesh of the Gums which first of all, their pores being filled with an ichorous Blood, swell up; but afterwards the salt Ichor going forth from the Blood, and being continually excreted, the flesh of the Gums, by reason of the defect of laudable nutriment, grows flabby, leaving the Teeth almost naked. Further, by a long afflux of matter plainly corrosive, the flesh of the Gums is eaten away; so that the Teeth can hardly stand, but grow loose or fall out of the corrupted Stalls: And by reason of the saline-sulphureous Particles, partly of the excreted humour, and partly of the putrefying Gums, being continually breathed forth, the filthy stinking smell of the mouth is excited.

Various Spots
and wheals.

10. Spots breaking forth in the Thighs and in other parts of the Body, are accounted a pathognomick sign of the Scurvy: These are sometimes about the bigness of a Penny, and often as big as a Shilling, sometimes the Skin seems to be marked or spotted an hands breadth or more in some part: Besides, these Spots are of divers colours, to wit, now

Citron

Citron Colour, now Dark, now Purple, and sometimes appear livid, blewish or black : P H A R.
 Besides, some have welks variously swelling, viz. now lightly, now with a hard, and as Part. II.
 it were a crusty skin, or they break out with scales here and there in all the members of
 the Body: Among the spots and breakings forth whether tumid, or equal, or rough, this
 difference is noted in general, viz. that these contain a matter not congruous with the
 Blood, wherefore being secreted from its Mass in its circuit, they are fixed in the Skin;
 neither are they altogether forsaken by the Blood, but that the Blood passing by adds
 to them others & new Particles, whereby it comes to pass that the extravasated matter,
 by the continual approach of the Blood, is either at length supp'd back again, or being
 subtilised is breathed forth, (and sometimes it is effected partly one way and partly the o-
 ther) or lastly that matter being ripened, runs into an Ulcer or Sore. Moreover, Welks
 almost of every kind do generally happen not only in the Scurvy, but in many other Di-
 seases, yea if at any time the Blood does immoderately boyl up through any occasions.
 But spots are portions secreted from the Blood, and every where forsaken by it; so that
 there is nothing of commerce between them & the circulated Blood, wherefore they in-
 crease not in bulk, nor suppurate, nor easily evaporate. The Citron or darkish Spots seem
 to be some portions of Choler or Melancholly, poured forth from the Blood into the Skin.
 But as to the black or Purple marks, it is to be known, that they are not excited in any o-
 ther diseases, besides pestilential Fevers, the venereal disease, and the Scurvy: In the
 Plague and malignant Fevers they seem to be certain rejected parts of the blasted and
 deadly affected Blood, to which always a Malignity and Contagion are joyned, as we
 have else where shown more at large: In the Pox and Scurvy, though there is not so
 much malignity found, that the Spirits of the Blood are greatly mortified, or that its
 liquor becomes so greatly blasted, yet we may well suspect, that in either disease, grow-
 ing grievous, the Blood being apt to be in some measure broken and coagulated, it grows
 together into lesser Clotters; which sort of Concretions of the Blood being extruded
 at the mouths of the Arteries, are fixed in the Skin, and according as these portions are
 greater or lesser, and participate more or less of the corrupted Blood, the Spots also,
 as to their bigness, and colour, are fixed in the Skin.

11. A Flux and looseness of the Belly happens frequent enough in the Scurvy, so that
 the Faces of the Belly, which are sometimes liquid and sometimes compacted, and of di-
 vers Colours, seem to exceed in quantity the aliment that is taken in, which sort of Flux,
 although it appear immoderate if it be stayed by the use of Medicines, presently the Sick
 are wont to find a swelling of the Ventricle and *Hypochondria*, a hardness of Breath, or
 a wasting of the Spirits. The cause of the scorbutick *Diarrhoea*, is partly, that the
 Chyle is not rightly cook'd, neither is it soon enough, or sufficiently born through the
 milky Vessels; hence stagnating in the Intestines and becoming degenerate, is cast
 forth adooors, but this chiefly happens, for that the impurities admitted within, from
 the bloody Mass, drop out from the little mouths of the Arteries, wherefore the things
 excreted are more copious sometimes than those put in.

The Flux of the
Belly.

12. By the like reason, Scorbutick and Hypochondriack persons are found obnoxious
 to frequent Vomiting, nauseous Belching, and heart pains: which Symptoms indeed
 do frequently happen in this Disease, partly because the Tone of the Stomach is loos-
 ned, and its Ferment vitiated, whereby it comes to pass, that the reliques of the Chyle
 evilly concocted, is turned into an austere Salt, Vitriolick, or other ways degenerate
 pulp, and besides, though the Stomach be ill, because the recrements of the Blood reitag-
 nating within, are poured into its Bosom.

Vomiting, nau-
seousness, &c.

13 Sometimes a dysenterick Affection, also frequent hæmorrhages or flowings of Blood
 at the Nose, the Fundament, Reins, *Thorax*, Gums and other places, follow those sick
 of an inveterate Scurvy: The cause of which Symptomes is, for that the Blood being
 made more salt, and therefore more apt to grow hot, easily breaks forth at the mouths
 of the Vessels; but chiefly, because when the tone of the solid parts is weakened, and that
 the Fibres are made very lax, the mouths of the Vessels become broader and disconti-
 nued, so that it does not rightly lead the passages from the extremities of the Arteries
 into the little mouths of the Veins, but that the Blood being intercepted between the
 openings of the Vessels, and being there apt to stagnate and flow out, by what it can,
 it easily breaks forth, and slides it self forth adooors.

Dysenterie and
Hæmorrhagies.

These are the chief Symptoms, which are wont to be inferred by the Scurvy, by rea-
 son of its taint; being impressed on the mass of Blood, and from thence translated
 immediately into other parts, some of which also happen to be caused, partly by the de-
 pravation of the nervous Liquor. Now we will next consider of the Effects and Acci-
 dents of this Disease, which are wont to be excited, almost only or chiefly by the fault
 of the nervous Juice.

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CHAP. IV.

The Symptoms and Accidents which are wont to arise in the Scurvy, by reason of the Taint impressed on the Brain and nervous Stock.

*Fearfulness and
languor of the
whole Body.*

1. **W**E have already intimated, that in the more grievous Scurvy, the moistning Liquor of the Brain and nervous appendix is wont to become thinner and poorer, whereby it comes to pass that most of the animal Functions are performed untowardly and slowly, hence, the locomotive power flags very much, so that the sick loving Idleness and ease, shun exercises and labors of the Body, go about unwillingly any Task, and presently being weary give it off. I have known in some the whole sensitive Soul to seem lessened, and as it were made unequal for the Body, so that the sick, believing themselves not able to walk, nor stand; have refused altogether to be raised, or to rise from their Beds; when as yet no evident cause did hinder, but that they were strong enough to do what was required: Besides such, however ingenious they were before, abhorred the Studies, and labours of the Mind, and plainly affected to wear out their Life by doing nothing.

Melancholly.

2. In an inveterate Scurvy the nervous Juice declines from a spirituous-saline disposition towards a four one; hence, as we have elsewhere shown, Melancholly, a fluctuation of the mind, an often mutation, and inconstancy of purposes, proceed: moreover, as the nervous Fibres are perpetually watered by the influx of such an humor, from hence, in some part, come the more light Spasms or Twiches, cramp-like contractures, and wandering Pains. But indeed the chiefest vice of the nervous liquor, is wont to be, that being stuffed with filths and fæculencies, it contains heterogeneous particles, and divers ways hurtful to the animal regiment: wherefore happen very often to Scorbuticks horrid and grievous Affections, of which sort, are the following Symptoms.

Scorbutick Palsie.

3. Paralytick Affections, viz. Impotency, or the resolution of one or more of the Members, also stupor, or lack of feeling, and a sense of tingling, or pricking, often follow upon a deep and heavy Scurvy: which sort of Symptoms are not however, for the most part, very much fixed and permanent, but sometimes they cease or remit, and anon are repeated or increased. The scorbutick Palsie is wont to be excited chiefly from three

*From 3 sorts of
Causes.*

sorts of causes, which now conjunctly now divisively produce this Disease. 1. For the Debility, or resolution of the Members, happens, because of the nervous Juice being departed, there wants a sufficient plenty or stock of the animal Spirits, whereby all the members should be actuated: Hence, the sick have the locomotive faculty flagging, or weak, as if infeeblled by old age, about the thighs, and feet, and sometimes in other extream parts, to which the influx of the Spirit doth not plentifully reach: perhaps afterwards, as greater afflux of the Spirits is carried to the affected Member, and is in the mean time elsewhere deficient, the disease ceases, or is transferred to another place. 2. Sometimes the animal Spirits, although they are plentifully and sufficient enough, in the parts, yet they are infected with Heterogeneous, and as it were narcotick particles, brought along with the nervous Juice, so that being as it were bound, & almost overwhelmed, they are not able sufficiently & nimbly enough, to perform their explosive endeavours, or labors: hence arise not only the impotency of the motive faculty, but also a certain depravation of the sensitive, viz. a benumbedness, and a sense of stinging, tingling or pricking, for that whilst the animal Spirits are loaded with an incongruous Copula, their irradiation, like the beams of the Sun, passing thorow a cloudy air, is performed, but refractedly, and disturbedly. 3. Although the animal Spirits are dispensed in a sufficient plenty, and are free and clear of any narcotick quality, yet oftentimes their passages are obstructed, so that the Commerce between the inflowing Spirits and those implanted within some members, cannot be performed conveniently; for it sometimes happens, that the more thick and earthy Particles do enter into the bodies of the Nerves with the moistning Juice; which so stuff the passages, about the enfoldings of the Nerves and other nervous windings, with their full burthen, that the irradiation of the Spirits in this or that member is wholly hindred. So I have known some, who have had a hand or foot wholly enfeeblled or resolved, whilst the arm, or thigh, with the rest of the Body was well.

4. From

4. From the like cause, viz. scorbutick Fæculencies, fallen upon the Bodies of the Nerves, Grievs or Pains also, which are esteemed the most frequent Symptoms of this Disease, do in some sort proceed; But as they are of a divers kind, they also arise sometimes from other Causes. For indeed, the scorbutick Pains are either more light, uncertain, and quickly passing away, which depend sometimes upon a *Flatus*, or Wind distending the Membranes, and sometimes on a sharp or Salt matter, poured forth, now from the Blood, now from the nervous Juice, upon the nervous parts; which kind of matter, for that it is impropportionate to the nervous Fibres, pulls or hawls them, and irritates them into corrugations or wrinklins and becomes painful: but, for as much as the same is quickly washed off by the flowing of the *Serum*, or dissipated by heat, the troublesome sense brought in from such a cause is more easily removed. Or in the second place, the scorbutick Dolors, are more grievous, very acute and hard to be moved, which sort also, are either fixed, or determinated to some particular place, or wandering transfer the Pain, and that most grievous, from one place to another, as may be perceived in a wandering and Scorbutick Gout, and Rheumatism, concerning which we shall discourse hereafter: In the mean time, fixed Pains and a long time remaining, are wont to be excited in divers parts, but chiefly in the Belly, Loyns, Thighs, *Sternum* or Chest, and in the Head: It will be worth our labour, briefly to describe the Pathologie belonging to every one of these places.

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Part. II.

Pains of which there are several Species.

1. The pain of the belly is so familiar to the Scurvy, that according to the German Idiom, it should take from thence its name. This Symptom, though in a lighter degree, almost continually afflicts some sick persons, to which is joyned now a looseness, and now a high binding up of the Belly: the reason of which seems to be, for that, when both the Blood and nervous Juice abound with impurities, both the Arteries and Nerves carry the plenty of excrementitious matter towards the sink of the Belly, which being fixed about the Coats of the Mesentery, or the Intestines, stir up constant Pains, by a perpetual pulling the nervous Fibres. But besides there happen to some scorbutical persons, Paroxysms or fits of very acute Pains, as it were Colical, Affections which being protracted for many dayes, yea sometimes weeks, miserably torment the sick: so that they think their Bowels to be pulled, and torn to pieces with the grievousness of the Pain: these pains are wont hardly to be allayed with any remedies, unless with the more generous Opiates; and as soon as the virtue of the Hypnoticks is consumed, they are repeated with their wonted Cruelty, but continuing with a longer fit, very often torments in the Loins and Back are propagated and at length are diffused on the members of the whole Body: to this sort of affection a Pallie does not seldom succeed. But then in respect of the Cause of the Scorbutick Colick, it is not probable that it should arise from a sharp matter, deposited within the Cavities of the Intestines, neither from any simple humor, however mischievous it be impacted in their Coats: for this is quickly shaken off, or goes into an Ulcer, besides that is easily exterminated by the use of Clysters, or Purges: but indeed, these cruel torments of the Belly can come from no other cause, than the mutual strivings and effervescencies of the Salts (which are of a divers Nature) fighting or struggling together, whereby truly the Nervous Fibres are pulled, and as it were torn asunder. For we may suppose, that certain four recrements of the nervous Juice, like to vitriolick *Stagmas*, being gathered together about the foldings of the Mesenterie, or other nervous parts of that region, to which comes a serous *Colluvies* from the arterious Blood growing hot, abundantly stuffed with the particles of a fixed, and as it were a lixivial Salt, and with those swellings up produces as it were piercing Pains. From thence it may be argued that the mine of the former morbid Stock descends from the Head, by the passage of the Nerves, into the lower Belly, for that great headaches, also the Vertigo and Swimming, or turning round in the Head often præceed, and not rarely succeed this kind of Colick. Besides, it appears that from the Bloody Mass there is a large supply sent of particles of fixed Salt, passing as it were by *Deliquium* or a straining thorow; because the fitt of this Disease being very urgent, the Urine of the sick appears of a deep colour, and is very much stuffed with Salt, and as it were lixivial, and oftentimes its superficies is variegated with divers Colours, like the train of a Peacock: But so soon as the Disease begins to decline, the Urine is better, and from hence they are wont to assume hope and signs of growing well. But that this affection of the Belly is often propagated into the Loins, the reason is because the nerves of the Loyns and the mesentery very intimately communicate, and in very many places are mutually inoculated: wherefore when the dolorifick matter superabounds in the passages of these, it easily passes into the neighbour processes of those: But then that the Disease encreasing, the pains being diffused thorow the whole Body, almost every Joynt and Member are afflicted, the reason is, because when a more plentiful provision of the morbid seed is begotten

1. An Almost continual Pain of the Belly.

2. Pains as it were of the Colick.

The cause of them.

PHAR.
Part. II.

Pains in several
parts of the Ab-
domen.

In the Loins
and Back.

In the Breast
and Pleura.

In the Head.

In the Thighs.

ten in the head, then can be derived to the whole stock of the first affected Nerves, viz. the moving and intercostal pair; part of it entering into the Bodies of the other Nerves, and also spinal Marrow, spread, abroad this morbidick mine, participating of acetous Salt into very many parts of the whole Body, which every where by the accession of the fixed Salt, from the bloody Mass becomes dolorifick: and lastly, after that the plenty of Spirits is profligated by the incongruous matter, the residue after the mutual effervescencies of the Humours, being in very many of the Nerves together beset, and mightily filled or stopped up, the waies of Emanation are obstructed, and their mutual commerce is broken off, so that 'tis no wonder if those long Pains end at last in a Pallie, not only in the middle of the Belly, where the morbidick cause seems to subsist, about the foldings of the Mesenterie, but in other places round about, Pains not inferior to the Colick, are wont to arise. I know a noble Maid that was obnoxious to most cruel Torments, near the *os Pubis*, during about the space of a Month, and were wont to be repeated upon any occasion, given without any suspicion of the Stone, or Ulcer in the urinary Passages: which kind of affection I judge to depend upon a morbid matter impacted in the nervous foldings, planted in the *Hypogastrium*. Further, it is familiar to scorbutical Persons, to find fits of very cruel Pains, sometimes in the right, sometimes in the left *Hypochondria*, and sometimes about the Region of the Ventricle: the causes of which we think to ly hid in the nervous foldings, belonging to the *Viscera* planted in that place.

2. Scorbutick Pains, are wont sometimes to infest the Loins, and also the Region of the Back, now above, now below, without any prævious Affection of the *Abdomen*, or of the Reins. I have known several keeping their Beds with such a Distemper, perpetually crying out Day and Night, by reason of the intollerable torment: The cause of this kind of Passion may be ascribed to the acetous Recrements of the nervous Juice poured on the Membranes, and Tendons of those parts, and so stirred up into effervescency by the accession of the Sanguinous saltiness.

3. By reason of the same conjoyning of Salts, affixed on the Membranes, Cloathing the *Præcordia* very troublesom Pains about the region of the Breast, and not easily to be removed, are often induced; hence the Bastard pleurisie is so frequent a symptom of the Scurvy. I have known many scorbutical persons very much troubled for a long while, with a most grievous Pain under the *Sternum*, so that in several so affected, I could not but think there was some Ulcer, abscess lying hid in the *Mediastinum*; when in truth this symptom did depend only upon the heterogeneous matter, brought thither, partly by the Nerves, and partly by the arteries, and there growing hot, being affixed to the Membranes; as the event often proved: for that the sick were freed, by the long use of antiscorbutick Remedies.

4. Hitherto we have recounted the chief kinds of Pains, infesting the middle parts of the Body. But in the Scurvy there is felt those no less troublesom, in the extreame parts, viz. the Head, Thighs and Leggs. As to the first, Headach is so rarely wanting to this Disease, that many by this effect are satisfied, chiefly that it is the scorbutick Venom; by which they become obnoxious to most grievous fits of this evil, and handled for a long time, and oftentimes repeated. The cause of this is obvious to every one, that it may be ascribed to the humours poured on the *Meninges* or Films inwrapping the Brain, which also Anatomie hath proved. For the Skulls of some of the dead being opened, I perceived both the membranes grown together, and every where set thick with little Whelks, and scirrhus tumors, which kind of tumors and concretions, seem to have risen from the mutual coagulations of the two-fold painful humour, after many effervescences.

5. Nor indeed is it any otherwise to be determined, as to the Pains most grievously afflicting the Thighs and Leggs of the sick, chiefly in the night time: for many labouring with an inveterate Scurvy as soon as ever they are warm in their beds, are wont to endure intollerable torments, about the calves of the Leggs, Shins and Thighs and sometimes about other parts, so that they cry out their flesh is gnawn, or torn in pieces like the biting of Dogs: These tortures if they leave their Bed, do somewhat abate; otherwise the afflicted are most miserably tormented all Night long: In this case there can nothing be more aptly conceived, than the acetous recrements of the nervous Juice, to fall down on the Leggs, as into a place having a great declivity and to be copiously affixed to their Membranes, to which whilst the rejected Salts do come from the Blood notably rarefied and agitated, thorough the heat of the Bed, & do ferment with these after the manner of Salts, therefore indeed from the mutual striving and effervescency of the Particles of divers kinds, the nervous Fibres being pulled and hawled beyond measure, run into painful Corrugations, neither do indeed these dolorifick Pains cease or remit, till the particles are gathered together, either evapo-
rate

rate or by their mutual wrestling being brought under are worn out, are quiet from their effervescence; but then within a little space, fresh provision of either matter disposes to a new paroxysm, by reason of the mutual effervescence, and coalition. Of these kind of Salts of a diverse kind; proceeding from a twofold humour, the wandering Gout, the Rheumatism and certain other affections are produced, which we deservedly impute to the conjunct dyscrasies, and as it were evil confederations of the Blood and nervous Juice. Moreover in the same Class certain species of scorbutick Pains but now handled, ought to be placed; but because they are of kin to other Pain, arising from the Sole Vice of the nervous Juice, or of the Blood, therefore we have here joyned together the divers Theories of the dolorifick Affections.

As there is a confux of Symptoms of a divers kind in the Scurvy, so there is begotten a manifold morbidick matter, and of a divers nature: viz. Heterogeneous particles coming into the Brain and nervous stock, with the moistning Juice, are sometimes narcotick, bringing forth the Palsie, and sometimes saline, causing Pains, (as we have said) also sometimes they are nitro-sulphureous and explosive, from which the spasmodic or cramp-like affections arise: but by reason of particles of this sort go together in the Brain, there happen to scorbutical persons, Vertigos, swimings in the head and outrageous assaults, like the falling sickness: From the like cause, possessing the nervous Stock, proceed convulsive motions, trembling, shakings and very often horrid contractions in the *Viscera* and in the Members. We have already spoken largely enough of the nature, differences and causes of Convulsions. Besides we have fully described certain admirable cases of this affection, arising from the scorbutick infection, so that it seems needless to discourse any more of this matter, for it may be easily accommodated by the hypothesis before delivered, to all the spasmodick symptoms of the Scurvy whatsoever.

6. Those labouring with an inveterate Scurvy are very obnoxious to a Vertigo: *The Vertigo.* Concerning this affection, and also of many other Cephalical, we have made special disquisitions, which may perhaps be sometimes made publick. In the mean time we will in one word signify that this Symptom arises, for that the animal spirits are in some measure perverted from the wonted ways of their expansions, to wit, being either hindred on otherways driven from their series, state, and orders are compelled to break off: this happens to come to pass as in other cases, so chiefly in the Scurvie especially for two causes, either for the one, or the other, or for both together; viz. either because the commerce of the Spirits is obstructed somewhere, in some passages and Pores of the brain, being possessed by some extraneous guest, or secondly, some companies of the Spirits, being burthened with an heterogeneous *Copula*, or joyning are compelled to stay behind the rest, or to go out of their tracts: In this Disease the liquor indeed instilled to the brain from a very impure blood, brings with it very many Fæculencies, by which it can be no otherways, but that the heterogeneous particles should every where stuff up the Pores of the Brain, and growing to the animal Spirits, oppose them or force them into explosions.

7. Almost for the like cause, sleepiness and torpor, or heaviness frequently happens to Scorbutick persons, viz. for as much as the animal Spirits being burthened with watery or narcotick Particles, and very much oppressed, cannot perform readily their expeditious and quick motions within the Brain very much also obstructed, neither continue long the acts and exercises of their functions, but love to ly down and to indulge themselves with idleness and rest. Moreover, this sort of affection sometimes is stirred up by the defect and want of the animal Spirits; for from the Blood very much vitiated and as it were dead, the Brain and nervous Stock is supplied but with a thin Liquor, and almost lacking of all *Vigor*: From such a *Prophasis* or occasion, I have known a Lethargie excited in those about to dy; by which the affected though they seemed to indulge themselves with a continual sleep, yet being called are wont to know those standing about them, and to answer those who speak to them; but the store of the animal Spirits growing weary, they were neither able to wake long nor to attend to discourse. When I have opened such who were overwhelmed with perpetual sleep, I have found the Brain dry enough and altogether free from a Dropsie, or serous *Colluvies*, with which lethargick persons are wont for the most part to be affected.

But sometimes on the contrary, some scorbutick persons are molested with almost continual waking. Which kind of Symptom proceeds sometimes from the affections of the mind, Grief, convulsive Passions, fear of Swooning, passions of the Heart, and also from the perturbations of the Stomach and of other *Viscera*; for as much as the Spirits being vehemently moved in every part of the sensitive Soul, their whole Hypostasis is detained from entering into rest, or a tranquil condition. For I have known some touched with a scorbutical Taint, who though they were free from Pains

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Part. II.

or Spasms, and also clear from any immoderate affection of the mind; have been induced to watchings day and night for many weeks, and oftentimes could get no sleep, though they had taken strong opiates: In the mean time they continued lively enough and ready to the performance of Labours, without any heaviness of the Head, and without any torpor or sluggishness of the mind or senses, as if they had wanted no sleep. The reason of this seems to be, that sometimes together with the nervous Juice, certain nitro-saline Particles of a fierce and unquiet nature, (of which sort are the Effluvia's falling from *Aqua fortis*, or the spirit of nitre) growing to the Spirits, compell them to be perpetually agitated and to be continually in motion: for even as Vapors breathing forth from stygian Waters, are never altogether fixed or at rest, so the heterogeneous Particles which are of that sort of Nature, adhering to the Spirits inhabiting the Brain, suffer them scarce ever to be idle or to indulge sleep. These are the chief symptoms that are wont to be stirred up in the animal regimen, by reason of the scorbutick raint being impressed on the moistning liquor of the Brain, and Nerves; which with those before mentioned happen by fault of the Blood, degenerating from its right *Crasis*. But as to those great & Herculean Diseases, to wit, the assaults of the Apoplexie and the Epilepsie, which sometimes happen to scorbutical Persons: In these cases the former affection, being as it were married to another more worthy, loses its name, and passes into the Pathology of that, as it were into its Progeny; lastly we will inquire what are the symptoms of the Scurvy by reason of the conjunct Dyscrasis of the Blood and nervous Juice, as it were joyning their alliances in Evil.

C H A P. V.

Of the symptoms of the Scurvy which arise by reason of the Conjunct Dyscrasies of the Blood and nervous Juice.

IN this rank, in the first place is set the scorbutick Atrophy or consumption of the Flesh: for who labour long with this Disease often fall into a *Marasmus* without any signal fault of the Lungs, or suspicion of a Consumption or *Phthisis*, so that the Flesh wholly falls away, and the Skin becoming very flabby, scarce sticks on the Bones: The cause of which ought not only to be attributed to the fault of the Blood degenerating from its right *Crasis* or disposition; for this however depraved it be, for the most part assimilates some portion of the nutritious Juice, and bestows it on the parts to be nourished: but indeed when as the nervous Juice is also bad, the nutritive faculty is altogether inhibited; for that by the defect or fault of this, the nutriment elaborated by the Blood becomes altogether unprofitable and unfruitful: By what means, as to nutrition, either Liquor, to wit, the Sanguinous and nervous discharge themselves, we have elsewhere shewn. From that hypothesis, which seems to be built upon sufficiently probable reasons, it easily follows that the Atrophie, familiar to the Scurvy depends from the conjunct irregularities of either nutritive faculty. For as much as the Blood gives only vicious aliment, and that the nervous Liquor fails in the actuating & assimilating it, there is a necessity for the solid parts, being continually defrauded of their food, to wither away.

2. The scorbutick Gout, which is very much wandering, and affects now this Part now that successively, now more parts together, and leaps about from one place to another, or from these places to those, seems to depend upon a double Stock, even as the Colick above described, but the manner altogether inverted. For indeed it is to be supposed in this Disease, that very many heaps of the fixed Salt, from the bloody Mass are disposed here and there about the Members and Joyns as so many Nests: which indeed being hid within so many distinct Cells, remain as the Eggs of Fishes, or as the feminine Seed, to which afterwards the acetous four recrements of the nervous Liquor come as the masculine Seed, and renders them fertil, to wit, in as much as the Salts of a divers nature, being commixed, they greatly ferment or grow hot; and so by the mutual wrestling and agitation of the particles, the Membranes and nervous Fibres being notably hauled, they are carried into dolorifick Corrugations. In truth, it from hence appears that the first Mine of this disease as also of the common Gout, is to be placed in the bloody Mass, and to be actuated by the Recrements of the nervous Juice, because when the assaults of the Pains arise in various parts together, or successively, the Blood seems not to grow hot above the measure, nor its salaments passing by *Deliquium* at that time flow out more plentifully; for that neither the Pulse becomes quicker nor the Urine lixivial. But in an urgent fit, very often a foregoing Headach, an heaviness of the Head or Vertigo, inquietude of the Members and often a leaping of the Tendons, which sort of Symptoms often precede or accom-

company the assaults of pains, argue the four recrements of the nervous Juice to suffer a flux. To this appertains that the acid liquors being drunk up, provoke the gouty Paroxysms. In the Scurvy indeed either Mine is more plentifully begotten, the nests of the Gout are longer published, and the pains in these do spring sooner by far: besides from a very impure Blood, a saline or tartarous matter is heaped up not only in the Joynts of the Feet or Thighs, but almost every where about the membranes and the interspaces of the Muscles, to which also an acetous *Copula* or joynting being poured out in many places from the nervous Juice, it becomes fruitful of Pains; then for as much as either Mine consists in a matter less thick, and is gathered in open places, it is either washed away in a little time by the *Serum* flowing to it, or it is dissipated by heat, or else being sucked again by the Blood, it is transferred to some other place.

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Part. II.

3. The Rheumatism, as it is described by modern Authors, often comes upon an inveterate Scurvy. Which sort of affection, exciting Pains almost in all parts of the Body, one after another, although it appears like to the wandering Gout, but now described, yet it differs from it both in respect of the pains, which in a Rheumatism quicker pass over, and oftner change their seat, and that with them are very often joyned a small Fever, and the tumour of the affected parts, and a *phlegosis* or Inflammation; as also by reason of the conjunct Cause, which indeed being of Kin to that which brings forth the scorbutick Colick, is clean contrary to the cause of the wandering Gout: For it seems that in the first preparation of this Disease, an acetous Mine is deposited in very many places from the nervous Juice, as it were the female Seed; to which sort of Symbols left in divers places here and there, whilst that the blood growing hor, pours forth its plentifully rejected saline reliques, presently upon the wrestling and Congression of dissimilar Particles. Pains are caused moreover, because the recrements of the Blood being exposed in the middle of its Course, they something hinder its motion, therefore a tumour and Inflammation is brought upon the part affected then, because the Blood at last licks up again the Matter, but now rejected by it self, and transfers it to some other place, those often shiftings and mutations of Pains happen. This Affection deserves a peculiar consideration: but this may suffice to have said these few things of it in general, to wit, as it is a symptom of the Scurvy.

3. The Rheumatism.

Hitherto we have unfolded the Symptoms of the Scurvy, arising from a threefold kind of Cause, the Pathologie of which contains in it self other manifold Affections, and very different in themselves: of which it is worthy to be observed, that as many Diseases, belonging to the Brain and nervous Stock, which exist very often alone and of themselves, come also upon the Scurvy; yet as to their formal reasons and as to the method, to be observed in the curing of these or those, a very great difference occurs. But when a Palsie, Vertigo, Convulsion, Lethargy, and other Diseases, of that kind happen of themselves, they always depend upon a more fixed cause, and very much on some notable fault of the Head and nervous Appendix; and as Cephallick remedies and appropriate to those Diseases only, are convenient, yet the success does not easily nor alwaies answer to their Wishes. In the mean time either little care is taken for the Emendation of the Blood, or if it be, for the most part it is in vain: But when these affections are brought in by the Scurvy, there is less danger, and although they have oftner fits, yet they more easily pass away; but the cure of the Disease is performed more happily by Antiscorbutick Remedies then by Specificks & by reduction of the Blood to a due *Crasis* or Complexion, rather then by administering any thing to the evils of the Brain and nervous Stock. The same observation is to be had in Tumours, Ulcers, the Dropsie & many other Distempers brought in by the Scorbutick infection, which otherways when excited by themselves, are healed only with antiscorbutick Remedies. The reason of which is, that in the Scurvy, the conjunct cause of the Symptoms and of very many Affections, consists for the most part only in the humours, to wit, in the Blood and nervous Juice, and not in the solid parts, viz. the *Viscera*, *Præcordia* and Brain, wherefore when their Dyscrasies or evil dispositions may be more easily mended, then the evil formations of the other Diseases of this kind, are more certainly and easlier or with less trouble cured, when excited by reason of the Scurvy than when they come to themselves. But when the Disease is more deeply rooted, and that the principle solid parts are hurt, (as it many times happens) viz. when the recrements of the Blood and nervous Juice, being impacted for a long time in them hurt their Tone, stuff their Pores and Passages, and bring forth in them Scirrhus Tumours, very often, or Ulcers; the aforesaid Symptoms, although imputed only to the Scorbutick Taint, seldom or never admit of a Cure, and by reason of this invincible Cause, at last the Scurvy is self becomes desperate and deplorable.

How the Diseases differ being excited by themselves, and brought on by the Scurvy.

CHAP. VI.

The Prognosticks of the Scurvy.

*The Prognosis
in the Scurvy
ought not to be
without consid-
eration.*

When in the scorbutick affection very many and sometimes very cruel and horrid symptoms together are wont to oppress, there is expected a *prognosis* from the Physician: Yea he himself, that he may the better institute the method of Curing, carefully weighs what may be the future event of the Disease: Notwithstanding Judgments in this case ought to be cautious, a long while suspended and not too rash, for very many (as have fallen under our observation) esteemed desperate, have grown well. I have known some whom a frequent and horrid *Asthma* had already seemed to have choaked, others continually dying with frequent swooning, and also others troubled either with the Palsie, or convulsive Paroxysms, or with a most grievous Colick, to be wholly freed in a short space by the help of Medicines. I have again known some scorbuticks swelled with the *Dropsie* through their whole Body, others reduced by an Atrophy to an extreme leanness, at last restored to perfect health. Therefore although those labouring with this Disease, are sometimes urged with affections highly dangerous, yet if the *Viscera* be still indifferently whole or at least not much vitiated, we ought not to despair of those evils, excited through the mere taint of the Scurvy. But on the contrary, when symptoms less terrible appear, if the Contents of the *Hypochondria* and *Abdomen* become hard and as it were schirrous, or if the Lungs begin to be corrupted; there is no great matter or benefit to be promised as to the cure of the Disease: But in cases not desperate, where a hope of recovering health is left, or at least the fear of sudden death is far off, if perchance the question be asked how soon or how long, how easily or difficultly the Cure may succeed, let the answer depend on these sorts of judgments.

1. The Scurvy as it does not strait kill those affected with it, or precipitate them into an incurable state, so neither is it soon or easily cured: For the chief cause of the Disease consisting in the dyscrasie of the Blood, is not easier to be taken away, than Wines to be restored to their due complexion when they are made fretted or ropy: Wherefore those corrupted with this taint, endure its hurt for many months, and sometimes years, yea sometimes through their whole life.

2. This Sickness depending on the sulphureous-saline intemperateness of the Blood, or like to the mere hot fretted Wine is more hardly cured; than if the same proceeded from the saline-sulphureous dyscrasie, or less adust like to ropy Wine: For this evil constitution of the Blood or Wine, may be after a sort brought again to the condition from whence it fell, but that is wont not easily to be reduced into the state which it departed from.

3. The Scurvy coming upon long Fevers and other Chronical Diseases, is cured, or coming upon an originally, or for some other occasions, sickly constitution, is esteemed of a more difficult cure, because indeed in these cases both the *Crafsis* of the Blood is more vitiated, and not seldom also some hurt is affixed to the *Viscera*. Next to these they are hardly cured, who by reason of an evil manner of living, and chiefly by the assiduous drinking of the more generous Liquors, have contracted this taint with hurting the tone of the Ventricle and other *Viscera*: But those who are become scorbuticks by reason of Contagion, the unhealthfulness of the Air, going to Sea, or a sedentary Life, are more often and with less trouble restored to health.

4. This Disease being yet fresh, so long as the taint being included only in the bloody Mass, is not yet impressed on the Brain and nervous stock, nor hath excited durable symptoms in the solid parts, often admits of a perfect Cure: But if the affection being more deeply rooted, is propagated into the animal Kingdom, and there produces spasmodick and dolorifick passions, and that its poyson hath spread it self more largely by the eruption of spots and breakings forth, and by the rofion or eating away of the Gums and Teeth, and by other pathognomick signs, it is scarce ever wholly extirpated; but the chief business of Medicine is employed in giving help to the Symptoms most grievously urging, and in suppressing their encrease and extremities.

5. Those who labour with an inveterate Scurvy, refuse to live moderately, but indulge their sickly appetite, readily desiring what is nought: And besides they are very morose and difficult to take Remedies, so that they very often delude the labour of the Physician that in truth it is better to leave them to their evil *genius*, than to de-

fame.

same profitable Medicines prescribed in this case altogether in vain.

6. Because this affection growing grievous, the morbidick matter is manifold and of divers sorts, so that the cause of the Symptoms of a various kind and nature, is engendred; therefore Remedies not only of one kind are administred, but when a certain method of Medicine, though prescribed with the best judgment, profits little or nothing in the Cure, the sick are not presently to be left off, but other medicaments and then others are to be tryed: For indeed the same things are not convenient to all, nor always to the same person. In the sick Body the powers and combinations of Salts and Sulphurs every where vary, so also Medicines not helping should be as often changed, till something congruous and helpful be light upon.

7. If that notwithstanding or by the use of Remedies not rightly administred, the Scurvy by degrees growing grievous, is carried daily into a worse condition, at length it induces a Dropsie or Consumption, the next passage then is to Death, either from this or that Disease: For after that the Blood is very much depraved, it pours forth its recrements, being more plentifully heaped up either on the Lungs, or in the *Viscera* of the lower Belly; and so causes an affection of this or that kind equally mortal.

PHAR.
Part. II.

CHAP. VII.

Of the Cure of the Scurvy.

AS to what respects the Cure of the Scurvy, for that it is not one simple preternatural affection, but a whole Legion that is to be put to flight; therefore the method of Curing ought to comprehend manifold indications, and those variously complicated and subordinate, which after the ordinary mode may be referred to these three heads: to wit, that they be preservatory which respect and take away the cause of the Disease, and curatory which respect and take away the Disease it self and its symptoms, and lastly vital, which may defend or restore the power and strength of the Patient.

The Indication
three-fold.

At the very beginning of the Cure we ought to aim at the cause of the Disease, for this like the Root being cut off or pulled away, presently the Trunk, Branches, and Fruit wither: Therefore as we have shown the cause of the Scurvy to be founded in the dyscrasie of the Blood, *viz.* being either sulphureously-salt or saltishly-sulphureous; the first work must be that it may be mended and made better, both of this or of that sort or nature. To this end in the first place impediments are to be taken away, then the primary intention it self is to be performed; for either scope or purpose Remedies are required, from Diet, Chirurgery, and Medicine: As to Diet, there shall be shewn hereafter a special method of living, in the mean time we will proceed to the rest.

Preservative.

The Reduction of the Blood to its due *Crafsis* by appropriate Remedies, is chiefly hindred by these two ways, *viz.* In the first place, because a provision of vitious nutritious Juice is continually inferred by it: Then Secondly, because the Recrements brought into its bosom are not sufficiently sent away, through convenient sinks: Therefore care must be taken that the business of the Chyle may be rightly performed in the first passages, both that the vaporous Recrements may be sufficiently purged forth by Sweat, the serous by the Reins and Lymphæducts, the bilous, by the gallish *Cystis*, the melancholy of the Spleen, and all the others of every kind by their proper emunctories; then these offices being rightly instituted we must endeavour to reduce by specifick Medicines, and chiefly those endued with a volatile Salt, the dyscrasie of the Blood: Remedies respecting every one of these intentions, ought to be used and administred together, but by what means and by what manner of administrations, shall be yet more particularly designed.

1. That the Chyle may be perfectly concocted in the first passages, care must be taken that the load of excrementitious matter heaped up in them may be exterminated, that the ferment being lost or depraved may be restored, that the passages and pores any ways stult and obstructed may be opened: To these ends, Cathartick, Digestive, and opening Medicines are destinated.

The Therapeutick
Intentions.

2. The Excrements gathered together in the bloody Mass, when they are not sufficiently sent away by their proper emunctories, may be drawn forth by other convenient ways: For this purpose also Catharticks or Purgers, and besides Diaphoreticks and Diureticks, or Medicines that evacuate by Sweat and Urine, are convenient.

3. The scorbutick dyscrasie of the Blood should be mended by Phlebotomy and specifick Remedies: Wherefore that the whole business of the preservatory indication may

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may be reduced to one point, the Remedies which perform its chief intentions are Catharticks, Blood-letting, Digestives, opening Medicines, Diaphoreticks, Diureticks, and Anti-scorbuticks or Specificks. Then, for that indeed Digestive and opening Medicines are imbued, either of them with acid, biting, or saline Particles, they more often overcome; besides, for that Medicines of this sort move conveniently enough by Sweat or by Urine, therefore the Curatory provision requisite to the aforesaid intentions, may be yet reduced to straiter limits; to wit, that it may almost only consist in Cathartick, Digestive, and Anti-scorbutick Medicines, to which Phlebotomy may be added as occasion serves: It now is my part to design some forms and prescripts of them, and also the manner of using them.

Purging.

Purging.

i. The method prescribed for the Curing almost of all scorbutical persons, begins with Purging Medicines; for unless the first passages are made clean, Medicines designed for any other use are infected by their filths: wherefore Vomiting sometimes is no less convenient than Purging.

By Vomit.

If the Ventricle (as it is often wont to be) is grieved with a viscid, souring, and unfavoury matter, and endeavours to cast out the impure Load, by a nauseating and striving to vomit, and if the Patient is wont to bear such an evacuation strongly enough and with ease, there is no hindrance, so that their strength be not too much decayed, but that an emetick Medicine may be administred: For the more strong, let them take an infusion of *Crocus Metallarum* or *Mercurius Vita*, or the tartarous Emetick of *Myrsichus*, or Glauber's Sulphur of Antimony: Those who are of a more thin and weak Constitution, let them take Wine of Squills, or the Gills of *Theophrastus*: Let those who take but a small dose, drink after it good store of Posset drink, till the Ventricle being full to nauseousness, Vomiting may be the more easily provoked, by ones Fingers or a Feather thrust down the Throat, which may be reiterated as often as they please. By this way of Vomiting the mere Contents of the Stomach being wiped from its foldings are sent forth; neither are there stirred up in any other of the *Viscera* about it, or in the Membranes (as it is wont to happen from Stybiates or Antimonial Emeticks) painful haulings or Convulsive, with swooning or fainting away. To those whose Ventricle, by reason of evil digestion, easily gathers together a load of Phlegm or other degenerated matter, I have prescribed (and often with good success) such a Vomiting once a month, which they have found safe and wholesome.

By Stool.

Where there is no need of Vomiting begin by a Purge, at least let there be some days between this and the other evacuation if this follows. I judge what in times past has been inculcated, by Authors, concerning the preparation of the humours, to be either needless, or the circulation of the Blood not understood, to be altogether erroneous: But in the place of that intention are substituted things restoring the Ferment of the *Viscera*, and things altering the *Crisis* of the Blood: In the mean time, that the filth of the first Passages and the recrementitious superfluities both of the Blood and also of the nervous Liquor may be sent forth; in the first place a light and gentle Purge is ordered and afterwards once a week it may be either oftner or seldomer repeated according to the strength of the Patient, and the strength of the Medicine may be proportionated according to the success of the first Dose. To this end Pills, Potions, Apozems, Electuaries, Powders, and many other forms of Medicines are wont to be prescribed.

Remedies made known in a more hot Scurvy.

If the Constitution of the sick be more hot, and that the Scurvy seems to be founded in an adust Discrasie of the Blood, viz. a Sulphureous-Saline, all Aloetick, and Diagrydiat Purges are to be shunned, and only the more temperate made out of Senna, Rhubarb, and others which do not too much agitate the Blood and Humours, are to be administred.

Pills.

Take of the leaves of Senna $\mathfrak{z}\text{ij}$, of Rhubarb $\mathfrak{z}\text{vj}$, of Epithymum $\mathfrak{z}\text{iii}$, Roots of Polypodium of the Oak, of English or Monks Rhubarb dried, of each $\mathfrak{z}\text{ss}$, of yellow Sanders $\mathfrak{z}\text{ij}$, of Celtick Spike $\mathfrak{z}\text{ss}$, of the Salt of Wormwood $\mathfrak{z}\text{ij}$, being cut and bruised, let them be digested in a Glass, in hot Sand, with white Wine and Fumitory Water, of each a Pint (or a Quart of our Magisterial antiscorbutick Water) for two dayes the Colature being clear, let it be evaporated in the gentle heat of a Bath, to the consistence of Hony, then add to it of the Powder of the leaves of Senna, and of Rhubarb, of each $\mathfrak{z}\text{j}$, of the Cream of Tartar $\mathfrak{z}\text{ss}$, make a Mass for Pills. The Dose from $\mathfrak{z}\text{ss}$ to $\mathfrak{z}\text{j}$.

Syrup.

Or prepare the same infusion, which being evaporated by a gentle heat, to the consistency of a Syrup by adding at the end, of cleansed Manna and white Sugar, of each $\mathfrak{z}\text{ij}$, make a Syrup. The Dose from \mathfrak{j} to \mathfrak{ij} spoonfuls in a convenient Vehicle.

Or of the Tincture of the same may be given $\mathfrak{z}\text{iiij}$ or vj for a Dose, by adding of the Cream of Tartar $\mathfrak{z}\beta$, and if there be need of Sweating, of the Syrup of Pippins $\mathfrak{z}\text{iiij}$. P H A R.
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Or put to the prescribed Tincture of Corinthian Grapes cleansed $\mathfrak{z}\text{vj}$, let them be digested hot till the Grapes Swell, which being taken forth, evaporate the Liquor to the Consistence of a Syrup, adding to it of Sugar and cleansed manna, of each $\mathfrak{z}\text{ij}\beta$, then the Grapes being lastly put into it, let the Medicine be kept in a glass Vessel, close stopped. The Dose from one spoonful to two. Tincture.
Of Raisins.

Or add to the aforesaid Tincture, being evaporated to the half part, of fresh Cassia, and of the Pulp of Tamarinds, extracted with antiscorbutick Water, of each $\mathfrak{z}\text{iiij}$, of the Conserves of Violets, of Damask Roses each $\mathfrak{z}\text{ij}$, of the Powder of Senna, of the greater Composition $\mathfrak{z}\text{j}$, of the Powder of Rhubarb $\mathfrak{z}\beta$, of Cream of Tartar, of the Species of Diatrion Santalon, each $\mathfrak{z}\text{ij}$, let them be bruised together in a Stone Mortar, till they are reduced to the form of an Electuary. The Dose about the bigness of a Walnut more or less, according to the success of the Operation. Electuary.

For those whose Stomachs being full of loathing and will not admit of the Medicines, but in a small quantity and elegant form: Take of the Refine of Scammony gr. iij to viij , of the Cream of Tartar $\mathfrak{z}\beta$, of Celtick Spike gr. vj , mingle them and make a Powder, let it be given in a spoonful of Gruel, or in the form of Pills. Powder.

Those who labour with the scorbutick Indisposition, and are of a more frigid and cold constitution, and where the Disease seems to be founded in a Nitro-Sulphureous disposition of the Blood, like to ropy Wine, are to have administred to them more sharp Catharticks endued with more hot Particles. Purges in a
more cold Scurvy.

Take of Stomach Pills with the Gumms $\mathfrak{z}\text{ij}$, of the Refine of Jalap gr. 20 , Vitriolat Tartar gr. 16 , Oyl of Juniper $\mathfrak{z}\beta$, with as much as will suffice of Ammoniacum, soluted in the Water of Earth-worms, make Pills 16, take 4 at a time once in 7 days. Pills.

Take of Pilulæ Tartar of *Bontius* $\mathfrak{z}\text{ij}\beta$, of the refine of Jalap gr. 12 , of the salt of Tartar $\mathfrak{z}\beta$, with what will suffice of Augustan Syrup, make Pills, 12.

Take of the Extract of Pil. Ruffi $\mathfrak{z}\text{j}$, of the Extract of black Hellebore $\mathfrak{z}\text{j}$, of the Salt of Tartar $\mathfrak{z}\beta$, with what will suffice of Ammoniac solute, make 9 Pills to be taken, 3 for a dose. Extract and
Syrup.

Take of the Leaves of Senna $\mathfrak{z}\text{j}$, of Rhubarb $\mathfrak{z}\text{vj}$, of Mechoachan, Turbith: with Gums, of each $\mathfrak{z}\beta$, of the Strings of Hellebore black $\mathfrak{z}\text{ij}$, of the Salt of Tartar $\mathfrak{z}\text{ij}$, of yellow Sanders $\mathfrak{z}\text{ij}\beta$, of Winteran Bark $\mathfrak{z}\text{ij}$, being sliced and bruised let them be digested in a Quart of Whitewine for two days, let it be strained without pressing it, and take of it by it self, from $\mathfrak{z}\text{v}$ to $\mathfrak{z}\text{vi}$, either in the extract or reduced to a Syrup, or electuary as the Tincture above described, but adding of as much as will suffice of the Powder of Arthritice, or of Diasena.

Or, there is prepared a Tincture of this sort, which may be given to strong men, from half a Spoonful to a Spoonful. Take of Salt of Tartar $\mathfrak{z}\text{j}$, of the smaller Spirits of Wine $\text{lbj}\beta$, let them digest till it becomes Yellow: to this being poured off from its Fæces, put of the Leaves of black Hellebore macerated in Vinegar $\mathfrak{z}\text{j}$, of yellow Sanders $\mathfrak{z}\text{j}$, the yellow part of Orange $\mathfrak{z}\text{ij}\beta$, let them digest being close shut up and warm for 3 days. The matter being Strained clear, let it be distilled in Balneo to the half part, the remaining Liquor keep for Use. Tincture.

Take of sharp-pointed Docks, of Polypodium of the Oak, stinking Nettles, and of Chervil, of each $\mathfrak{z}\text{vj}$, of the Leaves of Eupatorium and Betony, each j handful, of White Sanders and of Yellow, each $\mathfrak{z}\text{ij}\beta$, wild or bastard Saffron $\mathfrak{z}\text{j}$, of the Tartar of White-Wine $\mathfrak{z}\beta$, boyl them in three Pints of Spring Water, or $\text{lbj}\beta$, till half is consumed, add to it of Rhenish-Wine lbj , and presently let it be strained, to which put of the best Senna $\mathfrak{z}\beta$, the Yellow Rind of the Orange $\mathfrak{z}\text{ij}$, Rhubarb $\mathfrak{z}\text{vj}$, of the Leaves of Black Hellebore $\mathfrak{z}\beta$, infuse them being warm and close shut for 12 Hours, being strained, let it be kept in a Glass close stopped. The Dose is $\mathfrak{z}\text{v}$ to vj . Apogeme.

We might here add many other forms of Purges, but there is no great need of variety in these: of the aforesaid, either these or those which shall be thought most convenient, let them be administred, and every 5 or 6 days as occasion shall require iterated. Too often and violent purging, destroys the strength and very much wasts the force of the *Viscera*, and in the meantime takes not away the Disease.

After a Purge or two, if there be any need of taking away Blood, let it be done either by Phlebotomy in the Arms, or by Leeches in the Veins of the Fundament. It is not much matter which Vein is Cut: nor is there so much benefit in the opening the *Salvatella*, as hath been commonly thought. The great ado among Authors, who were ignorant of the Circulation of the Blood, about opening the Cephalick, or the Liver Vein, or any other chiefly in the Scurvy comes to nothing. Phlebotomy is indicated by Phlebotomy.

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by the plentifulness and Vitiousness of the Blood, which rather ought to be performed by taking away a small quantity often, than a great deal all at once: For when the bloody Liquor becomes very impure, it is not more certainly mended by any kind of Remedies, than by letting it forth often and sparingly. For as often as the old corrupted Blood is let forth, fresh, better and more pure succeeds. In the mean time there is need of Caution, lest too great quantity be taken away at once, for its stock being diminished together, Sanguification grows weak, and for that reason a Dropsie, or a Cachexia, or evil disposition of the whole Body follows.

After Purging, and (if need be) Phlebotomy, many other kinds of Remedies, no less necessary, are required in the Scurvy: In the prescribing of which in order, we ought presently to consider whether the Indications being only Preservatory they may have place here, or ought not to be deferred to those which are contrary, to wit, those which respect the more grievous Symptoms: But if you endeavour the whole business of the Cure against the cause of this Disease, proceed according to the following method: It shall be shown hereafter what sort of Cure is to be administred, (if perchance occasion requires) to the Symptoms.

Therefore if the business of Medicine be chiefly designed against the cause of the Scurvy, and that it may be first eradicated by it self, for this end, as we shewed but now, there are moreover to be made use of at all times except on the days of purgation, Digestive and Specifick, or antiscorbutick Remedies: to which sometimes if need be, may be added Diaphoreticks, or Diureticks, or Medicines operating by Sweat or Urine. The forms of Medicines, for the performing these kind of Intentions, and manifold prescriptions, and of various kinds, are every where extant among Authors. It pleases me however, to place here some of the more select, which I think good to distinguish into two Classes, according to the twofold nature of the Scurvy, to wit, the sulphureous Saline, and Saline Sulphureous. And in the first place we will deliver what is convenient in the latter Distemper, to wit, where there is need of Medicines, indued with a certain Incitation, and very much filled with a volatile Salt.

Digestives.

Digestive Remedies, which restore the Ferment of the Ventricle, and help its Function, and also of the other *Viscera* serving to the Chyle; and Antiscorbutick or Specifick, which take away the Dyscrasie of the Blood, are either joyned in the same Composition, or at least they are to be taken successively the same day.

Among the Digestive Medicines, are deservedly ranked, Cream of Tartar, Crystal Salt, and Tincture of Crystal, Vitriolate and Chalybeate Tartar, Elixir *Proprietatis*, simple Mixture: The use of every one of these given twice aday, does oftentimes prove beneficial.

Besides you may easily make with the two following *Menstruums* magisterial Tinctures and Elixirs of divers kinds and digestives, appropriate to the Scurvy.

Take of the Spirit of Vitriol rectified \mathfrak{z} vj, of the Spirit of Wine Alcoholifated \mathfrak{z} xvj, mix them and distil them in a Glasse Retort, with three Cohobations: Keep it for use in a Glasse very well stopped. The Elixir *Proprietatis*, is better and more easily prepared with this compounded *Menstruum*, than the ordinary way.

Take of Winteran Bark, of *Lignum Aloes*, of the Roots of the lesser Galangal, each \mathfrak{z} ij, of Cinnamon, Cloves, Cubebs each \mathfrak{z} j, *Ameos* or Bishops Weed and Nasturtium Seeds, each \mathfrak{z} ss, being bruised, pour on them the aforesaid *Menstruum* till it be 3 Fingers breadth above them, let them digest in a Vessel, in a Sand Furnace for 6 days. Strain it and keep in a Glasse close stopped. The dose 20 drops, more or less in a spoonful of Canary Wine or proper Water. Let it be given twice a day.

Take of the whitest Amber, of Gum Hedera, Caranna, Tacamahaca, each \mathfrak{z} j, of Saffron \mathfrak{z} ss, of Cloves, Nutmeggs, each \mathfrak{z} ij, bruise them and pour on them the aforesaid *Menstruum*, and as before draw forth a Tincture. The dose 20 drops as before.

Take of the Salt of blew Tartar \mathfrak{z} ij, let them digest with lbj of the Spirit of Alcoholifate Wine to the Extraction of the Tincture. This is the other *Menstruum*, whereby you may prepare Elixirs out of Gumms, Spices, &c. after the same manner as with the former *Menstruum*.

Specificks or
Antiscorbuticks.

Whilst these sorts of Remedies are administred in a small dose morning and evening, or first and last at Medicinal Hours, to wit, before eight in the morning, and four in the afternoon: other kind of antiscorbutick Medicines are to be taken, which for the most part we are wont to prescribe in a double form, to wit, solid and liquid to be taken together, so that the solid being first taken the other may be drunk after it: Of either there are very many Species and ways of Composition extant: viz. in the solid form, Electuaries, Confections, Powders, Pills, Tablets or Lozenges: In the liquid are Decoctions, Infusions, Expressions, distilled Waters, and medicated Wines and Ale. Of every one of these kinds we will propose some more select Medicines.

Electuaries.

Electuaries.

Take of the Conserve of the Leaves of Scurvy-grass, of Roman Wormwood, of Fumitory, of each ℥ij, of the Powder of Winteran Bark, of the Roots of Angelica, Aron, each ℥ij, of the Species of Diatrion Santalon ℥ijss, of the Powder of Crabs Eyes ℥j, of the Salt of Wormwood ℥ij, with what will suffice of the Syrup of Citron Peels, make an Electuary.

Take of the Leaves of Scurvy-grass, Conserve of Brook-lime, made with an equal part of Sugar, of each ℥iij, of the Troches of Capers and of Rhubarb, each ℥ij, of the Salt of Wormwood and of Scurvy-grass, of each ℥j, of the Powder of Ivory and Coral calcined, of each ℥j, make it up into an Electuary with as much of the Syrup of the juice of Scurvy-grass as will suffice.

I was wont to prescribe Conserve of the exterior Bark of Limons and Oranges, also of the Purple Flowers of the Ash-tree, of the Leaves and Flowers of Cardamine, of the Roots of sharp pointed Docks, and English Rhubarb prepared with an equal part of Sugar, which of themselves or mixed with other Conserve and species of the same kind are made into an Electuary.

Take of the Conserve of the yellow part of Oranges and Limons, of the flowers of the Ash Tree, of each ℥ij, of the Powder of the Roots of *Contrayerva* ℥j, of the lesser Galangal ℥ss, of the Roots of Aron ℥ij, of the Species *Aromatic. rosar.* ℥j, of the salt of Wormwood ℥ij, with as much of the Syrup of Candied Nutmegs, as will suffice to make it up into an Electuary. The dose of these kind of Medicines is the quantity of a Nutmeg, drinking after it some proper Liquor.

For Country people and the poorer sort, for whom less dear and more easily to be prepared Medicines are required, I prescribe after this manner. Take of the leaves of Scurvygrass and Brooklime, of each ℥iij, of the whitest Sugar ℥viiij, let them be well beaten in a Mortar together, adding of Winteran Bark powder ℥ss, of Tartar calcined with Nitre ℥iij, with as much Spanish Wine as will suffice, let it be made up into an Electuary. The dose about the quantity of a Walnut twice in a day, drinking an appropriate Liquor after it.

Take of the leaves of Scurvy grass ℥ij, of Raisins of the Sun stoned, of white Sugar, each ℥ss, the boylings of wild Radishes ℥ij: Let them be beaten together in a Mortar, and reduced to the form of an Electuary. The dose is about the quantity of a Walnut twice or thrice in a day.

Confections.

Take of Aron compound ℥j, of the powder of Winteran Bark ℥ss, of the Species of *Diatrion Santalon*, of the Troches of Capers, each ℥ij, of the salt of Wormwood and of Scurvygrass, each ℥ijss, of the rinds of Candied Oranges ℥iij: Let them be bruised in a Mortar together, then add of white Sugar dissolved, in as much as will suffice of the water of Earth Worms ℥iij, and so make it up into a Confection.

Take of the Roots of *Eryngo* and *Scorzonere* candied, of each ℥ij of Walnuts and *Myrobalans* candied, each No. ij, of electuary of *Sassaphras* ℥vj, of the powder of Cubebs and Cardamums each ℥ij, of the powder of the Roots of Zedoary, and of Angelica, each ℥ijss, of the salt of Wormwood ℥ij, with as much Syrup of candied Walnuts as will suffice: Make a Confection.

Take of the powder of *China* Roots, of *Sassaphras* wood, each ℥ss, of yellow and white Saunders each ℥ij, of the seeds of Rocket, Cubebs, *Nasturtium*, grains of Paradise, of each ℥ijss, of the Species *Dialacca*, Cinnamon, Orris, the lesser Galangal, each ℥j, of the salt of Wormwood ℥ij, of the Conserve of the yellow of Oranges, and of Sugar *anthosar.* ℥iij, dissolved in as much water of Snails as will suffice, and as before make a Confection: The dose as much as a Nutmeg twice aday, drinking after it some appropriate Liquor.

In some cases of the Scurvy, whence there is need of the use of Steel, or of Steel prepared with Sulphur, add of it ℥ij, or of Vitriol of Steel ℥ij, to any of the prescriptions of the Confections or Electuaries, and after the taking of the Medicine once or twice aday, exercise the Body according to its strength.

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Powders.

Take of the powder of Aron compounded $\mathfrak{z}\mathfrak{j}\mathfrak{ss}$, of Winteran Bark $\mathfrak{z}\mathfrak{ss}$, of Cubebs, the grains of Paradise and of Cardamums, each $\mathfrak{z}\mathfrak{i}\mathfrak{j}$, of the Salt of Wormwood $\mathfrak{z}\mathfrak{i}\mathfrak{i}\mathfrak{j}$, of the Orange Tablets $\mathfrak{z}\mathfrak{i}\mathfrak{i}\mathfrak{j}$. make a Powder: The dose $\mathfrak{z}\mathfrak{j}$ in a proper Liquor.

To the aforesaid Powder add of the Nuts of the Indian Fruit *Cassia* $\mathfrak{lb}\mathfrak{ss}$, let it be brought into a Mass or Paste in a warm Mortar, the dose $\mathfrak{z}\mathfrak{i}\mathfrak{j}$. Let it be taken after the same manner as Chocolate, viz. boyled in Spring water with either Rosemary flowers or Betony, or with the Roots of *Scorzonere*, or also with the shavings of Ivory or Hartshorn.

Pills.

For those who had rather have the Medicine in a lesser dose, and Form of Pills; take of the Roots of Virginian Snakeweed, *Conrayerua*, each $\mathfrak{z}\mathfrak{i}\mathfrak{j}$, of Winteran bark, seeds of Rocket and of Cubebs, each $\mathfrak{z}\mathfrak{i}\mathfrak{i}\mathfrak{j}$, of the salt of Wormwood and of Scurvy-grass each $\mathfrak{z}\mathfrak{j}\mathfrak{ss}$, of the extract or the rob of Juniper $\mathfrak{z}\mathfrak{ss}$, and with a sufficient quantity of the Syrup of preserved Nutmegs, make a Mass: Dose 4 Pills aday, drinking after them some proper Liquor.

Tablets or Lozenges.

For the more delicate Tablets or Troches are prescribed after this manner: Take of the powder of Winteran Bark, of the eyes of Crabs, each $\mathfrak{z}\mathfrak{i}\mathfrak{ss}$, of the powder of Pearls $\mathfrak{z}\mathfrak{i}\mathfrak{ss}$, of the finest Sugar $\mathfrak{z}\mathfrak{v}\mathfrak{j}$, dissolved in as much water of Earth-worms as will suffice, and boyled up to the height of Tablets: Add of the Spirits of Scurvy-grass $\mathfrak{z}\mathfrak{i}\mathfrak{j}$, of which make Lozenges or Tablets, each weighing $\mathfrak{z}\mathfrak{ss}$, take about $\mathfrak{z}\mathfrak{j}$ twice aday, drinking an appropriate Liquor after it.

The Orange Tablets sold in the Apothecaries Shops in Oxford.

Take of the Rinds of Oranges, Limons, and Citrons preserved, of each $\mathfrak{z}\mathfrak{j}$, of preserved *Eringo* Root $\mathfrak{z}\mathfrak{i}\mathfrak{ss}$, of Pine Nuts and Pistaches each 20, of sweet Almonds blanch'd number 10, of the powder of Anniseeds $\mathfrak{z}\mathfrak{i}\mathfrak{ss}$, candied Ginger $\mathfrak{z}\mathfrak{i}\mathfrak{j}$, *Species of Aromatic. Rosat.* and of Nutmeg each $\mathfrak{z}\mathfrak{j}$, of the Roots of Galanga $\mathfrak{z}\mathfrak{j}$, ten Cloves, of Amber grieſe *gr. iiij*, of Musk and Civet of each *ij* grains, of the whitest Sugar $\mathfrak{lb}\mathfrak{i}\mathfrak{ss}$ dissolved in Rose-water, and boyled up to a Tablet: Of which make Troches or Lozenges as before.

Liquid Medicines.

So much for Medicines in a solid form or more thick substance, that are wont to be given to scorbutical persons: That the virtue of which might be the better and with the greater benefit, carried into the mass of Blood, for the most part liquids are prescribed to be drunk after them: Although great variety of them and divers ways of compounding them are extant, yet the chiefest and most usual are those we mentioned above, and shall now subjoin the forms of each of them.

I. Decoctions.

Although Decoctions are the most familiar kind of liquid Medicines, yet more rarely made use of in the Scurvy, because the simples which are chiefly beneficial to this Disease, as Scurvygrass, Brooklime, &c. lose their virtues received from the volatile Salt by boiling; yet because Remedies by this means are easily and suddenly prepared, they ought to be admitted sometimes, for that it has been found by experience, that they have some efficacy. For Country and poor People, an easie Medicine by this preparation is commended by many Authors. Take of the leaves of *Nasturtium Aquaticum* or water Cresses *iiij* handfuls, of the lesser Sorrel *m ij*, being bruised let them

them be macerated or steeped in six pints of Milk, and then boyled till the third part be consumed: Take of it from 6 to 8 ounces twice aday. A Decoction of Worm-wood is praised by *Eugalenus* and others, the following Remedy I have often tryed with good success. Take of the tops of Broom *m iij*, cut small and boyled in 3 pints of strong Ale till half be consumed; let it be taken from *ij* to *iiij* ounces twice in a day.

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2. Infusions.

An Infusion being added to the Decoction, makes a most profitable Medicine. Take of the Roots of *Scorzonere*, of Chervil, each $\mathfrak{z}j$, of the leaves of *Eupatorium* and *Chamepitys*, each *m ss*, of burnt Hartshorn $\mathfrak{z}ij$, of Raisins *m ss*, boyl them in 3 pints of Spring water till the third part be consumed, add then of Rhenish Wine half a pint, and presently strain it into a glass vessel, to which put of the leaves of Scurvygrafs and Brooklime each half a handful, of the rinds of Oranges steeped and cut small $\mathfrak{z}ss$, make an Infusion warm and close stopped for six hours, strain it and let it be kept in a close Vessel: The dose $\mathfrak{z}vj$ twice in a day after a solid Medicine.

Take of Whey made with Whitewine or Cider $\mathfrak{lb}ss$, boyl in this of the Roots of Burr docks and *Eringoes* steeped, of each $\mathfrak{z}vj$, of preserved Juniper Berries $\mathfrak{z}ss$, the liquor being boyled away to the third part, let it be strained into a Jugg, to which let there be put of the leaves of Scurvygrafs and of Brooklime each *m j*, make an Infusion warm and close stopped for 6 hours: The dose half a pint twice in a day, after a solid Medicine.

Sometimes Infusions made by themselves are of notable use. Take of the leaves of Scurvygrafs *m j*, the slices of Horse-radish Roots *m ss*, Winteran Bark bruised $\mathfrak{z}ij$, let them be put in a glass Vessel with Whitewine or Cider, and Scurvygrafs water, each $\mathfrak{lb}j$, let an Infusion be made in a Cellar for 2 or 3 dayes: The dose $\mathfrak{z}vj$ to *viii* twice in a day as before.

3. Juices and expressions.

'Tis also a very commendable use to take twice or thrice in a day, of the Juice of antiscorbutick herbs or fruits or their expressions, by themselves or with their appropriate Liquors, for so it is presumed, the virtue of the Remedy is exhibited whole and undiminished.

Take of the leaves of Scurvygrafs, of water Cresses and of Brooklime each *m iij*, being bruised let the Juice be wrung out hard, and kept in a close Vessel: The dose $\mathfrak{z}ss$ to $\mathfrak{z}iiij$ twice in a day, in a draught of Ale, Wine, or distilled Water.

Take of the leaves of Scurvygrafs *m iiii*, of Wood-sorrel *m ij*, being bruised let the Juice be pressed forth, which being put into a Glass close stopped will quickly grow clear; for the sharpness of the Wood-sorrel precipitates the thicker parts of the Scurvygrafs: The same also happens if the Juice of Oranges is mingled with the Juice of Scurvygrafs, the dose $\mathfrak{z}ij$, or $\mathfrak{z}iiij$ twice in a day.

Take of the leaves of Scurvygrafs *m iiii*, of Brooklime and of water Cresses each *m ij*, of long pepper $\mathfrak{z}iiij$, of the shavings of Horse-radish $\mathfrak{z}ij$, all being bruised together let them be put into a glazed Vessel, with Rhenish or Spanish Wine which is best liked $\mathfrak{lb}j$, the mouth being very close shut, let it stand in a cold Cellar for two dayes, then let it be pressed forth strongly: The dose is $\mathfrak{z}iiij$ twice in a day, after a solid Medicine.

Take of the leaves of Scurvygrafs *m iij*, of Brooklime and water Cresses and of Wood-sorrel, of each *m j*, being bruised pour on them of the water of Snails and of Earthworms each $\mathfrak{z}vj$, make an Expression strongly, which keep in a Glass close stopped: The dose $\mathfrak{z}ij$ twice aday.

4. Syrups.

For the same reason as Decoctions so also Syrups are but little used in the Scurvy, for as much as the virtue of the simples chiefly efficacious, evaporates in the boiling; yet because there is need sometimes for sweetning of appropriate Liquors with such a Medicine for some; we will propose here our preparation, the strength of the ingredients being preserved as much as may be.

Therefore take of the leaves of Garden Scurvygrafs *m vj*, of the rinds of 4 Oranges and two Lemons cut very thin, of the slices of Horse-radish *m ss*, of long pepper powdered

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powdered \mathfrak{z} ij, all being bruised together let the Juice be pressed forth, which being presently put into a close stopped Glass, place in a cold Cellar till it settles and grows clear, then the Liquor being clear pour it off softly into another glass, and being fast shut let it be kept warm in *Balneo Maria*: In the mean time for every ounce, take of Sugar \mathfrak{z} iss, and let all the quantity be dissolved in as much of the water of Earthworms, and boyled up to a thicknes, to which let the aforesaid Liquor be poured by degrees, warm and stirred together with a *Spatula*: As soon as it is incorporated let it be taken from the fire, and being cold let it be put into a glass, and in this hang tyed up in a little Rag; of Cinnamon bruised \mathfrak{z} iss, of the seeds of water Cresses, and of Rocket powdered and mingled together, of each \mathfrak{z} j.

5. Distilled Waters.

Distilled Waters because they are a neat and pleasant Remedy, fill almost every Page among the anti-scorbutick prescripts: Some dispensations of these esteemed very profitable and fit, are in our *Pharmacopœa*; as the compound water of Radishes, and the mngisterial of Earthworms and of Snails. Besides, there are extant very famous prescriptions of these sorts of Waters, delivered by *Quercetan*, *Dorncrelius*, *Sennertus*, *Doringius*, and other Authors. Moreover every Physician is ready to prescribe as occasion serves, such like appropriate to the condition of every sick Body; for the anti-scorbutick Ingredients and others added, which may respect particular Distempers being received, and being cut, sliced, and bruised, are put into some convenient Liquor, to wit, Whitewine, Cyder, or the Whey of Milk made by either of them; then let the whole mixture be distilled in a Cucurbit or in a Rose Still: We will here subjoyn one or two forms used by us.

Take of the leaves of both the Scurvygrasses, of Brooklime, of water Cresses, and the tops of Broom of each m iij, of the leaves of Germander and *Chamepitys* or ground Pine each m ij, of the Roots of Horse-radish \mathfrak{lb} ss, of Aron, Angelica, *Imperatoria* or Master-wort each \mathfrak{z} iiij, the outer peels of 4 Oranges and of as many Limons, of the Roots of *Calamus aromaticus* \mathfrak{z} j, of Cinnamon, Cloves, each \mathfrak{z} ss, being bruised and cut pour to them of the best Cyder, \mathfrak{lb} vii, let them digest for two days in a glazed pot close shut, then let them be distilled in a common Still, the first and last water being drawn off let them be mixed together.

In Winter time when green herbs are not to be had, we prescribe after this manner: Take of the leaves of Scurvygrass m iij, the tops of Broom, Pinetree, and Juniper, of each m iij, the middle bark of the Elder Tree and of the Ash Tree each \mathfrak{z} ij, of the Roots of Horse-radish and of *Polypody* of the Oak, each \mathfrak{z} ij, the rinds of 4 Oranges and of as many Limons, of Winteran Bark \mathfrak{z} iiij, being cut and bruised put them into 8 pints of Whitewine or Cyder, or the Whey made of either of them, and let them be distilled.

The simple water of the leaves of Aron being distilled in the Spring time, is an efficacious Remedy against the Scurvy, if it be taken to the quantity of 3 or 4 ounces twice aday with some other Medicine.

The simple water of Scurvygrass being poured upon fresh leaves bruised and distilled and so often reitterated with new cohobations, becomes an effectual Remedy: Moreover, the strong Spirit of Scurvygrass is prepared after this manner. Take of the leaves of Scurvygrass as much as will suffice, being bruised let them be made up into Balls such as those of Woad which the Dyers use, then pour upon those Balls being put into a well glazed Pot, either as much of the water of Scurvygrass or of Wine of the same herb, as will cover them at least 4 fingers, and let them be kept exactly shut for 3 or 4 dayes in some cool place, then let the whole matter, being put into an Alembick be distilled: Let the distilled water, being put into a Cucurbit, be rectified, at first there goes forth the strong Spirit, of which may be taken in a fit Vehicle from 15 to 20 drops.

6. Anti-scorbutick Wine and Ale.

I was wont to prepare simple anti-scorbutick Wine of excellent use, after this manner in the Spring or Summer time. Take of the leaves of Scurvygrass gathered in a clear day as much as you please, being bruised and the Juice pressed forth, fill a Vessel of 3 or 4 Gallons with it, and putting thereto 1 or 2 spoonfuls of Yeast, let it stand to ferment for two days; then the Vessel being close shut let it be put into a Wine Cellar for 6 months, then the Liquor being clear and of colour like Spanish Wine,

Wine, draw it forth into Bottles and keep it for use: It may be kept good and incor- PHAR.
rupt for many years, the dose $\mathfrak{z}\text{ij}$ or iiij twice in a day. Part. II.

Medicated Wines, of which may be taken 4, 3, or 2 ounces at medical hours daily, as also at Meals, are prepared after this manner: Take of Scurvygrafs leaves $m\text{ iij}$, shavings of wild Radishes $\mathfrak{z}\text{iiij}$, of Winteran Bark $\mathfrak{z}\mathfrak{ss}$, of the outer rind of 4 Oranges and of as many Limons, and let them be put into a glass with 12 pints of White-wine, Rhenish, or thinner Spanish Wine: The Vessel being close shut up let it be kept in a cold place, and as often as you need, draw the Wine off clear.

It is a usual thing to prescribe for scorbutical persons, medicated Ale or Beer to be drunk constantly for their ordinary drink: Let Ale or Beer be prepared as much as will fill a 4 Gallon Vessel, and instead of Hops boyl therein of the tops of the Pine or the Fir-tree $m\text{ iij}$, and after it hath fermented in the Vessel, let there be put to it of the leaves of Scurvygrafs $m\text{ iij}$, of the roots of sharp pointed Docks prepared $\mathfrak{z}\text{iiij}$, the rinds of 4 Oranges, and after it hath stood 7 days drink of it.

These sort of medicated Ales may be prepared with other ingredients, according to the affection or temperament of the Patient, by which kind of Remedy the medicinal Particles altering the dyscrasie of the Blood, being continually carried into its Mass together with the Aliments, many have found much benefit in taking away the cause of the Scurvy. But for as much as we have shewn the cause of this, even as the species of the Disease to be two fold, and that hitherto the Medicines proposed, respect only the saline sulphureous intemperature of the Blood: In the next place it behoves us to add scorbutick Medicines, which are convenient in the other, viz. in the sulphureous-saline dyscrasie of the Blood.

CHAP. VIII.

Of Medicines of every one of the aforesaid Forms respecting the Scurvy, being excited in a more hot Constitution, and sulphureous-saline Dyscrasie of the Blood.

IN some scorbutical persons, the using much of the aforesaid sharp things; as Scurvygrafs, Horse-radish, Winteran Bark, and others endued very much with a volatile salt, hath been found hurtful: Wherefore in such like cases where the morbid cause consists in a more hot dyscrasie of the Blood, like to rosy wine, temperate Medicines less agitating the particles of the humors, apt to grow hot of themselves are prescribed: Wherefore we will here add the forms in the same order as the former, and first we will begin with the solid Remedies.

Electuaries.

Take of Conserves of Brooklime, Cardamines, made with an equal part of Sugar, of each $\mathfrak{z}\text{iiij}$, of the species of *Diatrion samalon*, and of *Diorrodon Abbatis* each $\mathfrak{z}\mathfrak{j}$, of the powder of Ivory $\mathfrak{z}\mathfrak{j}$, of Pearls $\mathfrak{z}\mathfrak{ss}$, of the salt of Wormwood and of Tamarisk each $\mathfrak{z}\mathfrak{j}$, and as much as will suffice of the Syrup of Coral, make an Electuary.

Take of the Conserves of wood Sorrel, and of Cynorrhodon or of Hyps each $\mathfrak{z}\text{iiij}$, (or of the Conserves of sharp pointed Docks, and of the roots of Succory each $\mathfrak{z}\text{iiij}$) of the troches of Rhubarb $\mathfrak{z}\mathfrak{j}$, of the species of *Diamargarit. frigid.* $\mathfrak{z}\mathfrak{ss}$, of Tamarisk Bark $\mathfrak{z}\mathfrak{j}$, of *Sal Prunella* $\mathfrak{z}\mathfrak{ss}$, preserv'd *Myrobalans* 2, and with what will suffice of the Syrup of preserv'd *Myrobalans*, make an Electuary.

For the Poor I was wont to prescribe this more ready Medicine. Take of the Leaves of Brook-lime $\mathfrak{z}\text{vj}$, of wood Sorrel $\mathfrak{z}\mathfrak{j}$, of white Sugar $\mathfrak{z}\text{viiij}$, let them be bruised and beaten together, by adding to it of the Flower of sweet Fenil Seeds $\mathfrak{z}\mathfrak{ss}$, of the Powder of Ivory $\mathfrak{z}\mathfrak{j}$, of *Sal Prunella* $\mathfrak{z}\mathfrak{ss}$, with what will suffice of the Syrup of the Juice of Brooklime, make an Electuary.

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Confections.

Take of the Powder of China Root, and of the Male Pæony, each ʒj, of which and yellow Sanders, each ʒiij, of Ivory ʒjss, of Pearls ʒss. of Crabs Eyes ʒj, of Coral being steeped in the Juice of Oranges, and ground on a Marble ʒij, of the whitest Tartar ʒjss, of white Sugar ʒvj, dissolved in as much water of *Scordium* compound as will suffice. Make a Confection.

Take of the candied Eryngo Roots, and of Scorzonere, each ʒij, of the Powder of Aron Compound ʒss, of the Species of *Diatrion Santal.* ʒij, of *Sal Prunella* ʒj, with what will suffice of the Syrup of Cloves. Make a Confection.

Powders.

Take of the Powder of the Leaves of *Chamepitys*, and of Aron Compounded, each ʒjss, of Ivory Powder, of red Coral prepared with the Juice of Oranges, each ʒij, of the Orange Tablets ʒij, mingle them and make a Powder, dose 1 Spoonful twice in a day.

Pills.

Take of the Species of *Diatrion Santal.* of *Diamargarit. Frigid.* each ʒij, of the Seeds of Citron and of *Carduus* bruised, each ʒjss, of the Roots of Cretian Ditany, and of the male Pæony, each ʒjss, of the Salt of Tamarisk ʒij, with what will suffice, of the Gelly of Harts-Horn or Snakes Skins, make a Mass.

Tablets.

Take of Species *Diatrion Santalon*, of *Diamargarit. Frigid.* of each ʒjss, of Perls powdered, of red Coral prepared; of Powder of Ivory, each ʒj, of Sugar ʒvj, dissolved in Water of *Scordium*, and boyled up to a Consistence, make Tablets as before.

If that with these sort of temperate Antiscorbuticks, there shall be any need of the use of Steel, let there be added to the Electuary or the Confection, or also to the Mass of Pills, of the Magisterium of Steel of *Mynsyethus*, or of the extract of Steel of our preparation ʒij: In some cases of *Crocus Martis* about ʒjss or ʒiij may be added to the like Composition: But it seems better to give the Chalybeates in the Liquors to be drunk after the solid Medicines, than to put them into the aforesaid Compositions. It remains now that we prescribe the forms of the Liquors.

Decoctions.

In the Scurvy excited after a long continued Feaver, these sorts of Decoctions are given with benefit, which may purifie the Blood and plentifully move Urine.

Take of the Roots of Chervil, Scorzonera, Sorrel, Parsely, of each ʒj, of the Leaves of Agrimony, and Harts Tongue, each mʒ, of Harts Horn burnt ʒij, of the Rinds of 3 Apples, of Corinthian Grapes ʒij, of Liquoris ʒiij, let them be boyled in 4 Pints of Spring Water till the third part be consumed, add to it of *Sal Prunella* ʒij, or ʒiij. The dose ʒvj, twice or thrice in a day.

Take of preserved Eringo Roots ʒvj, of Grafs Rcots ʒij, of the Leaves of Goose-grafs or Cleavers, mʒ, of Agrimony and of Liver-wort, each mʒ, of Raisins of the Sun, ʒij, of white Sanders ʒj, of Liquorish ʒij, let them be boyled in 4 Pints of Spring Water, to the Consumption of the third part. The dose ʒvj, after a solid Medicine.

For Country, and the poorer sort of People, that they might not fall into the Scurvy after a Feaver, I was wont to prescribe that they should take twice aday this following draught, viz. Take of the Rotts and Leaves of Dandelyon mss, let them be boyled in a Pint and half of Posset Drink till the third part be consumed: let it be strained and serve for two doses.

Or take of the Roots of Dandelyon mss, of Citron and *Carduus* Seeds, each ʒj, let them be boyled in a Pint and half of Posset drink made of Apples or Cyder till the third part be consumed.

Infusions.

Infusions.

The Apozems but now prescribed become more powerful against the Scurvy, if being prepared without Liquoris, they be strained into a Jugg, into which let there be put of the Leaves of Brook-lime and of water Cresses or Cardamines, each *mj*, then make an Infusion warm, and close shut for 6 Hours. The Liquor at last being strained, let it be kept in close Vessels. The dose $\mathfrak{z}\text{vj}$ twice or thrice in a day. Also make an Infusion of Whey boyled with the Roots of Dandelyon, or the Leaves of Fumitory strained into a Vessel with one handful of the Leaves of Brook-lime, and as much of Celandine the lesser.

Chalybeate Infusions are wont to be of frequent Use, to wit, of the Salt of Steel, or of the Magistery or Extract put into some Decoction or distilled Water; but as the natural Water or Spaws, so also the Artificial, of our preparation of Steel dissolved in Spring Water, and impregnated with the Infusion of Antiscorbuticks, hath been drunk with very notable Benefit.

Juices and Expressions.

Take of the Leaves of Brook-lime, of water Cresses, each *miii*, of wood Sorrel *mij*, being bruised let the Juice be wrung forth, and let it purifie in a Glas close shut, which it will soon do. The dose is $\mathfrak{z}\text{iss}$, to 7 Ounces in a convenient Vehicle.

Take of the Leaves of Brooklime *miii*, of the Branches or strings of English Rhubarb *mij*, being bruised let the Juice be pressed forth.

Take of the Leaves of Brooklime, of Cresses, of Cardamines, of the lesser Celandine, of wood Sorrel, each *mij*, being bruised let the Juice be pressed forth, add to it a fourth part of the Juice of Oranges: Let it be kept in a Glas.

Syrups.

As often as there is any need of Syrup for any other Composition, we make use of either the Compound Syrup of the Juice of wood Sorrel, or of Fumitory, or of Coral; or also a Magistral of the Juice of Brooklime may be prepared after the same manner, as we before prescribed concerning the Juice of Scurvygrafs.

Distilled Waters.

Distilled Waters more temperate are prepared, either by changing the ingredients, or the *Menstruum*, or both.

As to the first, proceed after this manner. Take of the Leaves of Brooklime, Garden Cresses, Fumitory, Harts Tongue, Liverwort, Baum, the tops of Tamarisk and Cyprus, of each $\mathfrak{z}\text{ss}$, of the Roots of sharp pointed Docks, of the Polypody of the Oak, each $\mathfrak{z}\text{ij}$, of the outward Bark of four Oranges, of cleansed Snails $\mathfrak{t}\text{bij}$, being cut and bruised pour on them of Whey made of Syder, $\mathfrak{t}\text{bvj}$, let them be distilled in a common Distillatory.

2. As the *Menstruum* is more weak, let the Ingredients be moderately hot.

Take of the Leaves of Scurvygrafs, of Brook-lime, of Water and Garden Cresses, each *mij*, the Rinds of 4 Oranges, a pint of Snails, being all cut small, pour to them of the common Whey of Milk, or fresh Milk $\mathfrak{t}\text{bvj}$. Let them be distilled in the ordinary way.

3. In the Scorbutick Atrophie and Tabid Disposition, where no hot thing agitating the Blood, Spirits and Humours ought to be admitted; both the Ingredients and the *Menstruum* ought to be temperate, and sweetning the Blood.

Take of the Leaves of Brooklime, of Cardamines, Harts Tongue, Maiden Hair, Liverwort, Betony, Agrimony, of each *mij*, of Snails cleansed $\mathfrak{t}\text{biss}$, (or the soft flesh of a Capon, or the Heart of a Sheep cut to pieces) being all scalded and cut, let them be bruised together, and then pour to them six Pints of fresh Milk (or Fumitory Water) and let it be distilled after the ordinary way.

Medicated Wines and Ale.

Although the use of Wines seems to be less agreeable in the Scurvy, excited by reason of heat, or the Sulphureous-Saline Dyscrasie of the Blood, yet when either the

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Stomach is more weak, or that by long custom, they at least require drink of Wine mixed with a little Water; the same sort of Liquor ought to be prepared, both more temperate and also medicated. And first of all may be granted them small Wines diluted with Water, and impregnated with the Infusion of Baum, Borage, or of Pimpernel or Burnet, or others.

Moreover Wines are prepared of the Juice of Currans, Rasps, Cherries, and of other Garden Fruit, which being ripened by fermentation become very grateful to the Stomach, and purifie the Blood; Then Cyder, the familiar and almost genuine Wine of our Country, so it be clear, sweet, soft, and without any sharpness, helps very much in the Scurvy. Besides to this Liquor, being freed from its Fæces, and put up into little Vessels, may be put ingredients of various natures or kinds; *viz.* of which sort are the tops of Pine or Fir-tree, the Flowers of Tamarisk, also the shavings of Harts-Horn, or Ivory, which will sweeten the Liquor and preserve it from growing sour; for as much as the Particles of the fluid Salt abounding in that Cyder, being apt to cause it to grow sour of it self, are hindered by dissolving the foresaid Ingredients.

The more temperate medicated Ale or Beer, is prescribed after this manner, *viz.* let there be Ale prepared to fill a small Vessel, holding 5 or 6 Gallons, in which instead of Hops, let there be boyled the tops of Pine or Fir Tree, or of Tamarisk, or the shavings of any of their Woods, then after it hath worked, put into the Vessel the Roots of sharp-pointed Docks dried, (than which certainly there is not a more helpful remedy in the Scurvy) to these sometimes may be added the Leaves of Brook-lime; Water-cresses, Barberries, and also Orenge and Limons sliced may be put into the Vessel.

The Leaves of Harts Tongue, put into the Vessel of small Ale, after fermentation, gives it a most grateful tast and smell.

CHAP. IX.

Of the Curatory Indication of the Scurvy, by which help is afforded to the Disease it self, and to the Symptoms chiefly afflicting.

WE have hitherto treated concerning the Cure of the Scurvy, and shewed what belongs to the preservatory indication, to wit, the taking away of the morbid cause, *viz.* both the intentions of healing and manifest Remedies. Which kind of method being timely entred upon and rightly instituted, oftentimes performs the whole business, for that the cause of the sickness or the Root being cut off, the distempers depending upon it wither away of their own accord. But yet we may not always follow this course directly, but sometimes stepping of one side, go another way to work, because sometimes more grievous accidents and symptoms happen, which require peculiar and as it were extraordinary help of Medicine, which ought to be attended upon immediately, and the general Cure often interrupted: As to this it is to be observed, that when the distempers which follow upon the Scurvy, require proper Remedies according to the nature of every one of them, and the disposition of the Patient, yet there ought always to be mixed with these Anti-scorbuticks. There will be no need to institute a curatory method, against all the diseases and distempers with which the Scurvy is wont to environ one, for so I might transcribe the whole practice of Medicine, but we shall have regard only to the symptoms chiefly afflicting, by which either the life of the Patient is endangered, or the principal Cure is hindered: By what means and with what Medicines such may be cured, we shall now shew.

Of the Curing difficult Respiration and Asthmatical Paroxysms,

Difficult breathing with straitness of the Breast and asthmatical fits, ought to be taken away by appropriate Remedies, and to be prescribed besides the general method, otherwise the sick may be soon brought into danger of life. As these kinds of evils arise for the most part in scorbutical persons, by the vice of the Blood stagnating in the heart, or by reason of the pneumonick Nerves, being hindered in their function, so they are to be cured with Cardiacks or anti-spasmodick Medicines, *viz.*

of Hartshorn, Soot, Blood, of mens Skuls, also the tincture of *Castor*, Antimony, or of Sulphur, the flowers of *Sal Armoniac*, the flowers of Benjamin, also *Elixir Proprietatis*, in these cases are of excellent use: Which kind of Remedies may be given at every turn, with a dose of some anti-scorbutick Liquor, proper also against the afore-said distemper. For the sudden allaying of difficult breathing, merely spasmodical when it afflicts very sore, I never found a more ready Remedy than 10 or 12 drops of our tincture of opiate *Laudanum*, being given in some convenient Liquor, for that sleep creeping on, the Spirits remit their inordinations, and being in the interim refreshed, they resume afterwards their pristine task after a due manner. The more sharp Clysters which very much cleanse the Belly, also sudorifick Decoctions and Diureticks often give help.

Take of the Roots of Bur-Docks, of Butter-Bur, Chervil, each $\mathfrak{z}\text{ij}$, of the leaves of Maiden hair and *Germander* each mi , of Bur-Dock and bastard Saffron seeds each $\mathfrak{z}\text{ij}$, of Raisins $\mathfrak{z}\text{ij}$, being cut and bruised let them be boyled in Spring water $\mathfrak{lb}\text{ij}$, to the consumption of the third part, add of Whitewine $\mathfrak{z}\text{iiij}$, let it be strained into a Jug, to which put of the leaves of Scurvygrafs cut mij , of the roots of candied *Enula Campana*, and cut small $\mathfrak{z}\text{ss}$, let them infuse hot and close shut for three hours: The dose $\mathfrak{z}\text{vj}$ twice or thrice a day.

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Of the Distempers of the Ventricle, that are wont to follow upon the Scurvy.

Sometimes scorbutical People are wont to be cruelly tormented with great pain and fulness of the Ventricle, also with a nauseousness and belchings, and sometimes also with cruel and frequent vomiting. Which kind of vices arise sometimes from the Chyle, being there degenerated into a putrefying humour, but more often from the morbidick matter being carried away, either by the passage of the Blood or the nervous Juice, and deposited either in the cavity of the Stomach, or fixed in the nervous folds and membranes. In these cases if a viscid or ropy stinking matter, or otherways hurtful be cast out by vomiting, and that it be suspected that the cause remains within the cavity of the Ventricle, a gentle Vomit of wine of Squills, or of vitriol Salt, will be convenient to be taken: Or if the peccant humour disturbs the Belly, either an extract of Rhubarb or an infusion of it, the Salt or Cream of Tartar being added. But if the matter sticks closely within the Membranes or nervous foldings, Diaphoreticks, or things restraining the effervencies of the Salts rather help: *Elixir Proprietatis*, or the flowers of *Sal Armoniac*, or the Spirits of Soot may be taken by turns, with the water of Rhadishes compound, or of Snails, or any other anti-scorbutick Liquor. In the mean time, once or twice in a day there may be applied to the region of the Stomach, a fomentation of Wormwood, Centaury, Camomil Flowers, the Roots of Gentian and others, boyled in White-wine, with woollen Stups dipt in it and wrung out very hot. The use of Clysters is convenient, and not seldom Opiates yield great help.

Of the Pain of the Belly and Scorbutick Colick.

There is almost no Distemper requires the speedy help of Medicine more than the Colick and torments of the Belly, which frequently happen in the Scurvy. Against these evils, Clysters of several sorts, Fomentations, Liniments, and Cataplasms are administered. Here the use of Opiates are thought to be very necessary, certainly in this case that prescript of *Riverius*, that purging Pills should be administered with some *Laudanum* mixed with them, may take place; for by sleep being moved, and a plentiful solution of the Belly being caused, very often the fits are taken away: But the powders of Shell-fish, by which the acetous Salts are imbibed or fixed, conduce very much to the profligating or driving away the morbidick cause. As for example, take of the powder of Crabs eyes, and of Egg shells each $\mathfrak{z}\text{iss}$, of Pearls $\mathfrak{z}\text{i}$, make a powder, let it be divided into 12 doses, let one of which be taken every sixth hour, with scorbutick water, or with the decoction of the Seeds and Roots of Burdocks, as is above described, or else with posset drink, in which is boyled the Roots and seeds of Burdocks, the leaves of sweet Marjoram, and Saxifrage, and the leaves of Scurvygrafs infused. In the scorbutick Colick, also in the distempers of the Ventricle, but now described; the use of *Epsum* and *Barnet* purging waters or the like, affords oftentimes very great benefit.

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Of the Lask and Dysenterical Distempers.

An inveterate *Diarrhœa* such as often happens to scorbutical persons, ought in no wise to be stopped with astringent Medicines, nor is it easily cured by alteratives or every Anti-scorbutick : Purging waters impregnated with iron or vitriol are the best Medicines for this distemper : Next to these are the artificial spaws or chalybeate Medicines, which are wont to give notable help. *Crocus Martis* rightly prepared is to be preferred to all others, I have used the following method with good success : First a Purge of the powder or the infusion of Rhubarb is to be instituted, with astringent Spices added, and often to be repeated every three or four days. In the other days, let a dose of the following Electuary of the bigness of a Nutmeg be taken in the morning, and at 4 a Clock afternoon. Take of the Conserves of common Wormwood made with an equal part of Sugar $\mathfrak{z}\text{vj}$, (in a more hot constitution, instead of this let Conserves of red Roses be taken) *species Diarrhodon Abbatis* $\mathfrak{z}\text{ij}$, of the powder of white and red Sanders each $\mathfrak{z}\text{j}$, of *Crocus Martis* the best $\mathfrak{z}\text{ss}$, with what will suffice of the Syrup of Steel, make an Electuary.

In dysenterical distempers or a *Tenasmus* or desire of going to Stool, you must proceed after the like method ; if it may be had, let the use of purging waters be instituted, besides let often Clysters Prepared of vulnerary decoctions be used. Lately I cured one greatly labouring with a tedious dysentery, who had for a long while voided by Stool many ounces of Blood, by this Medicine. Take of the best Rhubarb in powder $\mathfrak{z}\text{i}$, of the powder of red Sanders $\mathfrak{z}\text{ii}$, of Cinnamon $\mathfrak{z}\text{i}$, of *Crocus Martis* $\mathfrak{z}\text{liij}$, of *Lucatella's* Balsom what will suffice to make a pilulary Mass, he took 4 Pills sometimes every day and sometimes every other day for a week, and was perfectly cured. I also prescribed him to drink medicated Ale constantly, with the roots of sharp pointed Docks, and the leaves of Brooklime infused in it.

Of the Vertigo and fainting of the Spirits, and other Distempers, that are wont to be joyned to the same scorbutical Affection.

The *Vertigo* often comes upon an inveterate Scurvy, to which is wont to be added a fainting or frequent sinking of the Spirits and almost a continual fear or dread of it, also a *stupor* or stiffness in the members, and a sense of tingling or pricking here and there running about them, which kind of distempers proceed from the failure of the animal Spirits in the fountain it self, and sometimes of those within the Nerves, both the Cardiack and those serving for the motion of the Members ; and when they depend on the Brain and nervous stock, being beset very much with the scorbutick Salt, they are not easily cured. Cephalick Remedies, such as are convenient in the *Vertigo* and paralytick Diseases excited by themselves, are to be administered with anti-scorbuticks mixed therewith : Therefore first of all a provision of the whole being made by fit Catharticks, and such as are convenient in the Scurvy, you may proceed with appropriate Remedies against the said Disease after this manner.

About the beginning of the Cure, let there Blood be taken from the veins of the Fundament by Leeches, and unless any thing may contradict, let it be at several times repeated.

Take of the powder of the male Peony root $\mathfrak{z}\text{ss}$, of red Coral prepared $\mathfrak{z}\text{ij}$, of an humane Skull and of Elks Claws each $\mathfrak{z}\text{i}$.

Take of the best Sugar dissolved in the compound Peony water, or in the water of wild Radish, and boyled up to a consistence $\mathfrak{z}\text{viii}$, of the best oyl of Amber rectified $\mathfrak{z}\text{ss}$, make thereof Tablets, and take of them from $\mathfrak{z}\text{iss}$ to $\mathfrak{z}\text{iii}$ morning and evening, drinking after it a draught of the following distilled Water.

Take of the leaves of Scurvygrass, of Brooklime, of Cresses of the Garden, of the Lillies of the Valley, of Sage, Rosemary, and Betony, each $m\text{ iii}$, of green Walnuts $\mathfrak{lb}\text{vi}$, of the rinds of 6 Oranges and of 4 Limons, of the fresh roots of the male Peony $\mathfrak{lb}\text{ss}$, being bruised and cut, let there be put to them of the phlegm of Vitriol $\mathfrak{lb}\text{j}$, of Whey made with Cyder $\mathfrak{lb}\text{v}$, let them be distilled after the ordinary way, and let the whole water be mixed together : The dose $\mathfrak{z}\text{liij}$, to $\mathfrak{z}\text{liij}$.

Of Hæmorrhagies or Fluxes of Blood.

Great fluxes of Blood very often threaten great danger in the scorbutick distemper, in so much as the sick are given over, for that reason to sudden death, whilst the

the Blood breaks forth now from the Nose, now by the menstrual Flux or at the hæmorrhoidal veins, even to the fainting away of the Spirits or swooning: Besides that sometimes being cast out from the Lungs or Ventricle, gives a suspicion of an Ulcer lying hid, or at least a great debility in the affected part: Wherefore if these bloody excretions are immoderate, or happen in an inconvenient place, they ought for the present to be stopped, and prevented for the time to come.

For the staying of the Blood when it breaks forth immoderately, the method is commonly known, and there is nothing more to be done or particular in this distemper by reason of the Scurvy, than when excited upon other occasions: But as to the preventing Hemorrhagies, Remedies, which take away the acrimony of the Blood, and bind up the mouths of the Vessels being too loose and gaping, are to be administered, either intention is best performed by Chalybeate Medicines. The use of vitriolick Spaws is very fit in this business, beside the infusions of Steel, Extracts, Salt, and such kind of preparations which chiefly contain the saline or vitriolick nature of the Iron, are alway most profitable against Hæmorrhagies: by what means Iron and its preparations, produce these effects and several others in the humane body, we have shown already.

Take of the Conserves of red Roses, of Cynorrhodon or of Hipps each $\mathfrak{z}\text{ij}$, of the species *Diarrhodon Abbaris*, and *Diarrion Santalon* each $\mathfrak{z}\text{ijss}$, of the salt of Steel $\mathfrak{z}\text{j}$, of the best *Crocus martis* prepared $\mathfrak{z}\text{ij}$, of red Coral prepared $\mathfrak{z}\text{ijss}$, with what will suffice of the Syrup of Steel, make an Electuary: Let the quantity of a Nutmeg be taken thrice in a day, drinking after it a draught of some proper Liquor.

For poor people I am wont to prescribe after this manner, Take of the tops of Cypress, of stinging Nettles each $\mathfrak{z}\text{iiij}$, of Brooklime $\mathfrak{z}\text{ij}$, let them be pounded in a Mortar with $\mathfrak{z}\text{x}$ of white Sugar, then add the thin shalings of Iron finely powdered $\mathfrak{z}\text{i}$, of the Powder of white and red Sanders each $\mathfrak{z}\text{ij}$, with what will suffice of the Syrup of Nettle juice, make an Electuary: The dose the quantity of a Walnut twice a day.

Take of distilled water, or of a temperate anti-scorbutick Decoction $\mathfrak{lb}\text{ij}$, of our Steel prepared $\mathfrak{z}\text{ij}$, mingle it in a glass: The dose from 3 to 4 Ounces.

Take of the tops of stinging Nettles, of Brooklime each $m\text{ iiij}$, being bruised let the juice be pressed forth and kept in a Glass, the dose $\mathfrak{z}\text{ij}$ or $\mathfrak{z}\text{iiij}$ twice a day, with distilled anti-scorbutick Water.

Of the Vices of the Mouth coming of the Scurvy.

As soon as the scorbutick Taint seises on the parts of the Mouth, so that the Gums begin to swell, and their flesh to become spongy, presently Remedies which may drive away putrefaction from them, are carefully to be administered: Among these, things to wash the mouth and liniments are of chief use, whilst the Disease is beginning about these parts, or growing grievous therein, which yet have respect to various intentions, and so are severally to be prepared, viz. the flesh of the Gums at first swelling up, are to be freed and dried from the incursions of the Corrupt and salt Blood or *Serum*: Afterwards their flesh growing flabby and falling from the Teeth, is to be defended from rottenness, and also that it may more strictly embrace the Teeth, it is to be constrained or bound closer, for these and perhaps other intentions, Gargarisms or waters to wash the mouth of several kinds are instituted: The chief Ingredients of which for the most part are boyled vegetables and infused Minerals. The Herbs or Roots which are boyled in some fit liquor, viz. Water or Wine are most commonly either sharp, bitter, or styptick or binding, and so these sort of Decoctions are impregnated, either with a Volatile, Lixivial, Vitriolated, or chalybeated, or aluminous Salt, we will here shew you some forms of every kind of them.

1. When therefore the flesh of the Gums begins first to swell up, and to become spongy by reason of the influx of a corrupt and salt Blood and *Serum*; take the middle bark of the Elder Tree and of the Elm each $m\text{ iij}$, of the leaves of Savory, Sage, Hedge-mustard, garden Cresses, each $m\text{ j}$, of the roots of Pellitory $\mathfrak{z}\text{ij}$, being bruised and cut let them be boyled in $\mathfrak{lb}\text{iiij}$, of Lime water, to the consumption of the third part: If a sweetening be required, add of honey of Roses $\mathfrak{z}\text{ii}$, make a Gargal. Or take of Camphorated Vitriol $\mathfrak{z}\text{i}$, (commonly called by our Countrymen by the name of Captain Green's Powder) a quart of Spring water, mingle them in a glass and shake them well together, and then the Liquor settling and growing clear, may be made use of. Or let there be prepared a Lye of the ashes of Broom, or Rosemary, or of Nitre,

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of Tartar calcined, boyl in 3 pints of this, of the leaves of Savory, Thyme, Sage, Rosemary, each *mj.* when it is strained put into it two handfuls of Scurvygrafs leaves, make an infusion close and warm for three hours, then let it be strained again, and kept to wash the mouth often in a day.

For the same intention also, Liniments may be used between whiles, and especially at night be applied, that their virtues may be communicated to those that are sick, or while they are sleeping. There is a prescript very celebrated among Authors, and by long use confirmed. Take of the leaves of Columbine, of curled Mint, Sage, Nutmeg, Mirrh (which sometimes may be omitted) of each *3ij*, of burnt Allum *3ss*, of Virgin Hony *3iiij*, or what will suffice, make a Liniment according to Art.

2. When the Flesh of the Gums growing flabby, forsakes the Roots of the Teeth, sometimes a light Scarification may be administered, besides let the mouth be washed with this Decoction. Take of the tops of the Bryar, Cypress and Lady-smock Leaves, each *mj*, let them be boyled in three Pints of Water, in which Iron hath been quenched, to the Consumption of the third part, to the straining add of Hony rosat. *3ij*, mingle them.

This kind of Liniment may be applied. Take of the Powder of the *Florentine Oris*, of the Leaves of Sage and of St. John's Wort, each *3ij*, of bole Armenic, of *Sal Prunella*, each *3j*, of fresh Virgins Hony, as much as will suffice, let them be well incorporated, by working them together.

3. When the Gums begin to putrefy and corrupt, and also the Teeth, and the flesh about them grow loose and yield a noysom Savour, more strong Medicines and great resisters of Putrefaction are administered, here an infusion of Vitriol Camphorated, also of the Medicinal Stone, have the chief place.

Or take of the Roots of Gentian, and of round Birthwort being cut, each *3ss*, of the Leaves of the lesser Centaury, Pontick Wormwood, Savory, Columbine, each *mj*, let them be boyled in Lime water, or a Lie made of either Iron or Alum *℥iiij*, to the consumption of the third part. Add to the Colature of raw Hony *3ij* or *iiij*, mingle them.

4. If the falling out of the Teeth be chiefly feared, take of the Bark of the Roots of the Sloe Tree *3j*, of Tormentil and Bistort whole, each *mj.* of the outer Rinds of Pomegranats, and the Flowers of the same, each *3ss*, let them be boyled in three Pints of Spring Water. Add to it when strained, of Alum 2 or *iiij* drams, of the best Hony *3ij*, mingle them. Take of Vitriol Camphorate, of burnt Harts-horn, each *3j*, of Nutmegs *3ss*, of the best Hony what will suffice, make a Liniment. Or take of the Powder of the Root of Bistort, of the Rinds of Pomegranats, of bole Armenick, of burnt Allum, each *3j*, of Hony of Roses what will suffice, add of the Spirit of Vitriol *3j*; make a Liniment.

5. If at any time (as sometimes it is wont) that deep and putrid Ulcers eat into the Gums or other parts of the Mouth, the aforesaid more strong Remedies are often to be used. Besides, let little raggs be often applied to the affected place, steeped in Egyptian Oyntment dissolved in the Spirit of Wine, or in an Infusion of Sublimate, or of the medicinal Stone. In these cases the Cure is to be left to a skilful Chirurgeon.

Of the Pains that are wont to Infest the Leggs, and sometimes other Limbs, Chiefly in the Night.

Against these Pains, for indeed they are sometimes very bitter; besides the general method of curing the Scurvy, Specifick Remedies, and things helping this Symptom are ordered. Therefore in such a case, the means of Purgation being instituted, and Phlebotomy also (if there be need) celebrated, it is convenient to set upon the Disease with inward Physick, and outward Topicks.

As to the first, those which move by Sweat and also by Urine, does often avail, for that they carry another way, the lixivial and four recrements of the Blood and nervous Juice, that are wont to be gathered together in the affected part: But chiefly those things are to be administered, which may defend either Humour from its depraved nature, viz. both Saline and Sour: shelly Powders, Crabs Eyes, Jaws of Pikes, also Spirits, and Flowers of *Sal Armoniack*, Spirits of Blood, Tincture of Antimony and of Coral: Detoxions of the Roots and Seeds of Burdocks, *Chamepitys*, German-der, very much help. Which kind of Remedies are to be taken twice or thrice a day with Antiscorbutick distilled Waters. Water distilled out of Horfedung, to which is added Scurvygrafs, Brooklime, Gout Ivy, and such like, is sometimes very profitable.

profitable. In the mean time Liniments, Fomentations, Cataplasms and such kind of Applications which allay Pains, are outwardly to be applied.

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Of the wandring Scorbutick Gout.

Eugalenus, Wierns, the *Campan* Physitian, and *Gregorius Horstius*, have wrot particularly of this distemper, said to be very frequent in the Northern Countries of *Belgia*. A certain Sign of which is manifested by putting alive Worm to the grieved place, for he is presently wont to leap off, twine himself about, bend himself round, to slide along, and to dye: which I have also often experimented on our Country-men. The reason of which Experiment (as it seems) is this: we have determined the cause of the Pain and Tumour stirred up in the affected part, to be for that the saline or Lixivial Fæculencies from the Blood, and the sour, from the nervous Juice, being deposited in the same place, do mutually ferment or grow hot, even as Spirits of Vitriol and Salt of Tartar, mingled by deliquium or melting: further from such a striving and agitation of dissimilar particles, as the Pain and Tumour are caused, so indeed very sharp, and as it were Corrosive Effluvia's plentifully evaporate, which kill the worm laid upon the grieved place, even as if he should be held over those Liquors boyling: Because of the effect of this Experiment, the cure of this Disease has been ordained by Worms, to wit, Remedies prepared of them; but I know not whether being taken inwardly, they so certainly destroy the Disease, as they being applyed outwardly, are destroyed by the Disease. Even as Worms, so also Snails, Hog-lice, or Sows, and other bloodless little animals, for that they abound in a volatile Salt, do often enough become an efficacious remedy.

Henry Petrus relates two remedies used against this Disease, in *Westphalia*. Take 9 Worms bruised together, with two spoonfuls of Wine in a Mortar, and wrung out hard through a woollen Cloth, to these add half a measure of Wine, and let it be taken 3 spoonfuls morning, noon and night, for several dayes: 2. Take two or three spriggs of Savin, two spoonfuls of Virgins Hony, let them be boyled in a measure of Wine, till two fingers breadth be wasted: let it be strained, and take of it 4 or 5 spoonfuls thrice in a day. A certain Vulgar Potion, a kin to the former Medicine is cited by *Horstius*, and called the Monasterie Potion: Take of Sage, Betony, Rue, of each 5 Leaves, of earth-Worms, every one with red rings about their Necks, number 5, a little Savin, of Devils-bit Roots 2, let them be bruised with Water of Elder Flowers, and the Juice being pressed forth, let it be given to move Sweat. Also the like Prescript is proposed by the *Campan* Physitian in *Forestus*.

Certainly in this distemper the Magisterial Water of Earthworms, prescribed in the London Dispensatory, is extreamly convenient. I have often given also with good success, the Spirits and Salts of Harts-horn, the Spirit of Blood, and the Flowers of *Sal Armoniack*. Besides the shelly Powders, as of Crabs Eyes, Corals, Pearls and Vegetables, which have in them Antidotes for the Gout, as the Roots of Birth-wort, the Leaves of Groundpine, Germander, and the like joyned with Antiscorbuticks, conduce to the cure of this Disease. Outwardly, for the allaying of the Pains, besides Anodynes, things under the form of a Liniment, Fomentation or Cataplasim, are made use of: The Oyl of Earth-worms, Frogs, and Toads, are often very profitable. I was told by a very signal Person much obnoxious to this Disease, that the Water of the Contents, taken from the Ventricle of an Ox newly killed, and drawn off clear by distillation, and with Raggs dipt in it warm, and applyed for a Fomentation, brings certain help.

Of the Convulsive and Paralytick Distempers that are wont to come upon the Scurvy.

When at any time the scorbutick Taint breaking in upon the Brain and Nervous Stock, doth greatly infect the moistning Liquor of either Province, for that reason indeed, several Diseases, and chiefly the Paralytick and spasmodick, or cramplike distempers (as we have already shown) are wont to arise: even according as the morbid matter, being carried to the Animal Kingdom, shall be either narcotick or explosive. Although these kinds of Distempers shall be accounted in this case Symptomatical, yet they being very grievous, do challenge for themselves both the name and the greater part of the Cure, before their parent the Scurvy; so that the Sick is said rather to labour with the Palsy, or the Convulsion, then with the Scurvy, and also Medicines proper for those distempers, are at the same time proposed, with the others requisite to other intentions.

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For the curing those Distempers coming upon the Scurvy, that chiefly must be performed, that the Remedies appropriate to them be rightly or conveniently applyed with Antiscorbuticks. As to the Convulsive Diseases, what I have made known in a former tract, may be easily transferred hither. But as to the Palsie, Lethargy, and many other distempers of the Brain, and nervous Stock, we intend shortly to make publick some special Disquisitions thereupon: In the mean time it is not fit, that we should in this place forestall the therapeutick Method, which belongs to those discourses, but rather we will propose what may seem necessary at the end of this Work, the Cases and Cures of some scorbutick Persons, lying sick also of those Diseases.

Of the Atrophy or wasting of the Flesh: also of the Scorbutick Feaver, which oftentimes is either the Cause of it, or the accident, or effect of it.

There are three kinds of Causes, hanging by a certain Series, from one of which or more the scorbutick Atrophy without the Consumption of the Lungs is wont to be produced, viz. either the Chyle is perverted by the default of the first passages, by which means it does not carry sufficient or laudable provision to the Blood. Secondly, or being brought to it, yet by the fault of the Blood, it is not rightly changed into Blood and nutritious Juice. Or thirdly and lastly, the nutritious Juice being prepared in the bloody Mass, by reason of the fault of the nervous Liquor, is not rightly assimilated in the solid parts.

The Remedies appropriate to this Symptome respect either the emendation of the first passages, or of the aforesaid Humours. As to the first, sometimes it happens by reason of the Tone of the Stomach being broken, or its Ferment vitiated, so that it comes to pass that the aliments put therein are not rightly dressed, but turn into an unprofitable Rottenness. To these sort of evils, gentle Catharticks, digestives and strengthners are to be administred. But more often the work of Chylification or of making the Chyle, is hindered by reason of a Schirrous Tumour, being excited now in the Ventricle, now in the Mesentery or in the circumjacent part. In this case opening and dissolving things are convenient; and the use of Spaws or Purging Waters has bore away the Bell from all other remedies: Besides Fomentations, Liniments, or Plaisters, ought to be outwardly applyed.

Further, it sometimes happens that without any Tumour stirred up in the Viscera, the milky Vessels being impacted by some thick and viscous Matter, to be so much obstructed, that the Provision of Chyle, though laudable enough and plentifully made, is not sufficiently carried into the Blood. In this distemper, for the most part the Belly voides copiously white excrements like curdled Milk, and not like others dyed or stinking with Choler. The reason of which is, for that the impoverished Blood more sparingly begets the yellow bile, from which being poured into the Intestines, the colour and stink of the Excrements proceed. In this case the purging Spaws are convenient, and also with things opening, taken inwardly, Liniments, Fomentations, and Baths are used outwardly.

Against the *Marasmus* or wasting of the Flesh, arising from the fault of the Blood, degenerating from its Complexion, Asses or Cows Milk diluted with Water, or other proper Water distilled, often brings help. The broth of Snails or milk Meats, with them boyled in them; besides distilled waters of Milk or Whey, with Snails and temperate antiscorbutick Herbs mixed, help very much in this Case: also to this end, decoctions with Vulnerary and antiscorbutick Herbs infused therein are taken with good success: In the mean time Frictions to the external parts, with woollen cloathes made warm and dipped in resumptive Oyntment, or the fresh Oyl of Walnuts, may be daily administred.

When the Atrophy arises from the Vice of the distempered Blood, perverting by that means the nutritious Juice, it hath most commonly joyned with it, an erratick Feaver with nightly sweats, for that the sanguinous Mass is compelled to inequal and uncertain effervencies by that degenerate Juice; and that the so troublesome matter is cast out by the nightly Sweat. In this case a slender Diet being ordered, let them often take Decoctions and distilled waters, which fuse and purifie the Blood, with antiscorbuticks mixed therewith.

Take of the shavings of Ivory and of Hartshorn each ʒijss , of *Eringo* Roots preserved ʒvj , of the Roots of Chervil, Dandelyon, each ʒss , of the leaves of Harts Tongue and Liverwort each m , one Apple cut, of Raisins of the Sun m , let them be boyled in Spring water ℔iij , to the consumption of the third part: Being strained, put into it of the leaves of Brooklime bruised m , of *Sal-Prunella* ʒss , or of fixed Nitre

Nitre 3j, make an infusion warm and close for 3 hours : Take of it iijj or ʒvj thrice in a day. PHAR.

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Take of the leaves of Brooklime ʒiiij, of Sorrel and Dandelyon whole each m ij, of Snails cleansed ʒiij, the rinds of two Oranges : Being sliced, cut, and beaten, pour to them of sweet Milk or Whey made with Cyder, or of the Juice of fresh Apples ʒvj, let them be distilled after the ordinary way, take of it ʒiii twice or thrice in a day.

Of a Rheumatism.

This Distemper we have determined to proceed from the congression and mutual effervencies of the Salts which are of a divers nature and generation, to wit, of the fixed coming from the Blood, and the acetous coming from the nervous Juice.

The subjects of either Salts are the superfluous feculencies deposited, and by the aforesaid humours acted into certain turgescencies or risings up, being spread abroad into the parts, now into these now into those : Wherefore that the Disease may be cured, and the turgescencies of the humours allayed, both their superfluous feculencies are to be purged forth, and also both the degenerate Salts of either order, are to be reduced and made volatile.

For the two former intentions, a light Purge and Phlebotomy are chiefly required, and ought to be often repeated according to the strength of the Patient ; also Diureticks and Diaphoreticks which may convey forth some way the Salt Serosities, are next to be given : That these sort of Evacuations may the better succeed leisurely, with a good habit and nature assisting, Opiates are often made use of : For the other scope on which the chief hinge of the cure doth turn, alteratives, and chiefly those which are indued with a volatile Salt, do greatly help : Wherefore in this case it is a common, but not to be contemned Medicine, to drink twice or thrice a day 4 or 6 ounces of an Infusion made of Stone-horse dung, in small Wine or Ale or in proper distilled water. But a Medicine a little more grateful, though not more efficacious may be prepared, if a water be distilled out of that Dung with anti-scorbutick Ingredients, infused in Whitewine or Cyder ; which may be taken twice in a day from ʒiij to ʒiiij, I have often prescribed in this case Spirit of Hartshorn, and of Blood, with very signal benefit to the sick.

Of the Dropsie.

As we have determined that the Dropsie that is wont to succeed upon the Scurvy, is two fold, viz. habitual and occasional, we should utterly lose our labour to speak of the cure of the former ; for in truth no Remedies can be able to restore the Liver, and the Lungs, and the other *Viscera* sometimes vitiated, and the complexion of the Blood wholly overthrown. In such a case if any thing be thought fit to be done, the bounds of Medicine will be but narrow, for neither for Catharticks nor Diaphoreticks, nor for any other more strong sort of Evacuation, is there any place left : Therefore chiefly and indeed only Cordials and Diureticks must be insisted on. To these ends, *Elixirs*, *Tinctures*, *Electuaries*, *Powders*, *Infusions*, *Decoctions*, *distilled Waters*, &c. which are partly against the Dropsie and partly against the Scurvy, are to be administred ; but because they signifie little we shall omit prescribing their forms.

The scorbutical Dropsie suddenly excited from an evident or certain occasion, as hath been shown, very often admits of a Cure, which that it might more easily succeed, first of all the tumults of Nature are to be quieted, and its inordinations to be suppressed : Wherefore if waking do very much infest, Sleep must be allured by the use of Opiates, and then it must be provoked as often as there is great need. As soon, as by reason of strength, it may be lawful to purge, let the following Powder be taken, and a due space being between let it be repeated, and in the interim let the Belly be kept soluble by frequent Clysters. Take of *Mercurius Dulcis* ʒj, of the resine of Jalap gr. v to 10, of Cloves ʒss, mingle it, and let it be given in a spoonful of Water-grewel ; at other times Diureticks and sometimes Diaphoreticks are carefully to be taken. Take of the tincture of the salt of Tartar, impregnated with an infusion of *Millepedes* or Hoglice as much as you will, let there be taken of it ʒj to ʒij twice in a day, with an appropriate Liquor.

Take of the Spirit of *Sal Armoniac* what you will, the dose ʒss to iʒ drops after the same manner. Take of *Millepedes* prepared ʒiiij, of the Salt of Tartar ʒij, of Nutmegs ʒj, mingle them and make a Powder : The dose ʒss twice in a day with a proper

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proper Liqueur. Or take of Bees dried and powdered 3ij, of the powder of Amec's Seeds 3i, of the oyl of Juniper 3j, of Turpentine, what will suffice, make a Mass of Pills: The dose 3j 3ss twice aday, drinking after it a specifick Liqueur.

Take of the leaves of either Scurvygrafs, of water-Cresses, Pepper wort, Arsefinart, each *m* iij, of the Roots of Aron, Briony, of the Florentine Oris each 3iiij, of the middle Bark of the Elder Tree *m* ij, of Winteran's Bark 3ij, the outward rinds of 4 Oranges and of 3 Limons, of new Juniper Berries 3iiij, being cut and bruised, put to it of Rhenish Wine 3 pints, of Wine of the Juice of Elder Berries 1b ij, let them be distilled after the ordinary way, and let all the water be mixed together. Dose 3iiij twice in a day, after a dose of any of the Medicines prescribed before.

Let there be prepared Decoctions and medicated Ale, such as hath been before described, adding thereto anti-dropical Ingredients.

Of the Crackling of the Bones.

There yet remains a symptom sometimes, though rarely coming upon the Scurvy, viz. a crackling of the Bones, the cure and reason of which being omitted in the former Pathology, it will not be amiss to speak of it here. I have known some, but not above three or four, who whilst they laboured with the Scurvy were troubled with its evil, not only in the humours and fleshy parts, but at last also in the Bones themselves, for as often as they bended any of their Members any way, the heads of the Bones as if they were naked, rubbing against one another made a great noise: Further, as they lay in bed and turned themselves from one side to the other, a great noise from the collision of the *Vertebrae*, as if it were the shaking of a skeleton, was plainly heard, even affrighting those so affected.

The Conjoint Cause of this perhaps may seem to be, that the soft *interstitium* of the Bones, viz. the Fat, Membranes, and Ligaments, being greatly wasted, their junctures even as millstones, being altogether emptied by reason of their mutual rubbing together, make a noise: But the matter is quite otherwise, because those that are greatly wasted away have not this crackling noise of the Bones, nor do those who labour with this Distemper always waste off their flesh: Wherefore we rather say that the immediate cause of this symptom, is the dryness of the Bones or a defect of the *medulla* or marrow so properly called, which ought to be contained within the cavities of the Bones, and chiefly within their heads: For as certain Bones do include marrow or an unctuous humour every where shaken out, either from the great cavities or pores, and the small passages, we have determined the use of this to be, that both the Bones being thus moistned, may become less brittle, and moreover, that this humour moistning the knobs of the Bones, may make slippery all the joyntings, even as Grease or Oyl the hinges of a Machine, and by what means facilitates their motion: Wherefore the heads of the Bones being destitute of this marrow, make a noise like to the wheel of a Cart that is seldom greas'd.

But if the procatartick or more remote cause be inquired into, viz. wherefore that unctuous liniment of the Joynts becomes defective; this indeed is to be imputed either to the vice of the Blood, as if it did not supply the Bones with aliment, participating equally with Sulphur and Salt, which truly seems unlikely, because the bloody Mass also in scorbutical persons, contains Particles of either of the aforesaid kinds, and for that these labouring with the crackling of the Bones, have their Skin & Muscles sufficiently moistned with fatness: Or secondly and more likely, this unctuous humor by which the Joyntings are made slippery is wanting, through the fault of the Bones themselves, viz. because their pores and passages being so much obstructed by some extraneous, and perhaps muddy matter, or tartareous carried thither by the Blood, that for that reason they cannot receive sufficiently the Balsom destinated for them, nor send it forth for the moistning their Joyntings: It will not be easie (for that the matter lies so abstruse) to investigate the particular reasons of this Distemper, nor to conjecture further in this *Ætiology*.

We are no less at a loss, how to proceed in the cure of this Disease: For although the primary indication, viz. the humectation of the Bones or Joyntings is obvious enough, yet by what means and by what Remedies that should be performed, does not so plainly appear. For I have known in this case very many kinds of Medicines, and several ways of Administrations tryed altogether in vain. A certain ingenious man, labouring for many years with this Disease, had taken the advice of many, and of the most famous Physicians, and besides the usual Remedies against the Scurvy, (together with often letting Blood and purgations, from which he received no help) he tryed various and long courses of Physick without any success: for after he had under went a method prescribed by one Physician for some months in vain, he applied himself to another and so again to more. In the mean time, from each of them was prescribed

prescribed always a new way of curing, unessayed by the former: Fomentations, Liniments, and Frictions are daily applyed to the Joynts, and sometimes the Baths or Bath were used, and then several sorts of purging waters, sometimes one sometimes another were drunk; all which nothing helping out, a chalybeate course was taken, and another time a decoction of the more temperate woods, sometime a Milk Diet, and again at another time Electuaries, distilled waters, *Apozemies*, and other Remedies prepared against the Scurvy. After this manner when he had lived almost constantly medically and miserably above three years, and nothing profited as to the Cure of the aforesaid Disease, but in the mean time he was indifferently well as to his strength and Stomach, he married, and as to the rest of the common Symptoms of the Scurvy became better: Hence it appears too pertinacious a Disease, yielding almost to no Remedies, the crackling of the Bones is, which I have also proved in others, labouring with the same Distemper altogether mocking and eluding the skill and pains of the Physician.

CHAP. X.

Of the Vital Indication, in which are included Cardiack Medicines, Opiates, and Diet, or the manner of living as to Eating or Drinking, requisite in the Scurvy.

WE have hitherto largely unfolded the Indications both Preservatory and Curatory, which belong to the Cure of the Scurvy, it yet remains that we speak of the vital Indication, to wit, that we may declare by what method and by what Remedies, the strength of the sick being too apt to languish, may be sustained, or being lost and cast down may be restored. For these ends, Cordials and Opiates are prescribed to be taken, according to the exigencies of the sick, and besides a right way of living as to Diet, and if need be an analeptick or restorative, and always anti-scorbutick is prescribed.

As to Cardiack Medicines, to wit, which throughly agitate the Blood, stagnating in the heart, resuscitate or raise up its half spent flame, restore the animal Spirits oppressed or distracted to a free and due irradiation, it is obvious that very many Remedies which properly are called Anti-scorbuticks, do perform these intentions, of which sort are the compound water of Radishes, the magisterial of Snails and Earthworms, the Spirits of Hartshorn and Soot, the Shelly Powders with many others, which are not only taken with benefit at certain hours, according to a method ordained in a certain order, but also as occasion shall serve when ever a *syncope* or fainting of the Spirits shall happen.

But besides those who are found very obnoxious to passions of the Heart, frequent Swoonings, Nauseousness, Vomiting, Tremblings, *Vertigo's* and other horrid Symptoms, have also ready other sorts of Medicines, more properly Cordials, by which they give relief immediately to their fainting Spirits. To this end is very convenient the *Elixir Vita* of the greater composition, in the distillation of the same *Elixir*, the second water may be given to a spoonful sweetned, also the Bezoartick Water, *Aqua mirabilis*, Gilbert's temperate water, Treacle and Cinnamon water, to each of which compounded or of themselves, may be added *Confectio Alchermes*, *Confectio de Hyacintho*, powder of Pearls or the magistery of Coral, Syrup of Clove Gillyflowers, of Coral, of Citron peels, or of Cinnamon: Of these and others of this Rank, divers forms of Medicines are wont to be prescribed, as for Example.

Take of Treacle water and *Aqua mirabilis* each $\mathfrak{z}\text{ij}$, of Balm water $\mathfrak{z}\text{iiij}$, of the Syrup of Clovegillyflowers $\mathfrak{z}\text{ij}$, of the Confection of *Alchermes* $\mathfrak{z}\text{j}$, mingle them: The dose 3 or 4 Spoonfuls.

Or take of *Aqua mirabilis* $\mathfrak{z}\text{vj}$, of Snails and of Walnuts each $\mathfrak{z}\text{ij}$, of the Powder of Pearls $\mathfrak{z}\text{j}$, Confection de *Hyacinth*. $\mathfrak{z}\text{j}$, of the Syrup of Clovegillyflowers $\mathfrak{z}\text{j}$, mingle them.

When scorbutical Women are wont to be troubled with hysterical Distempers, or Men with Convulsive; take of Balm and Pennyroyal water each $\mathfrak{z}\text{ij}$, the compound water of Briony $\mathfrak{z}\text{iiij}$, of the tincture of *Castor* $\mathfrak{z}\text{ss}$, of the tincture of Saffron $\mathfrak{z}\text{j}$,

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3j, of the Syrup of Clovegillyflowers 3iss, of *Castor* tyed in a rag and hung in the glass 3j, the dose is 3 or 4 spoonfuls.

For those who had rather have Cordials in a solid form, Electuaries or Tablets are prescribed.

Take of the Conerves of Clovegillyflowers 3iij, of the Confection of *Alchemes* 3ss, of the powder of Pearl 3, with as much as will suffice of the Syrup of Coral, make an Electuary.

Take of the species of *Diamargarit. frigid.* of *Diarrhodon Abbatis* each 3iss, of Pearls powdered, of the best Sugar dissolved in Treacle water, and boyled up to Tablets 3iij, of the oyl of Cinnamon 6 drops, make Tablets according to Art.

As to what relates to Opiates and anodyne Medicines, in some distempers of Scorbüticks, I had rather want the use of any other kind of Medicines besides than of these, for indeed I have found by often Experience, that there is no better Remedy, not only against pertinacious pains and wakings, but in asthmatical paroxysms, in Vomiting, Fluxes, and also in the *Vertigo*, and in the Convulsive Distempers, as often as nature being irritated or provoked above measure, hath fallen into most cruel inordinations, than that Sleep might be allured by some safe Narcotick being given: In the mean time there is need of caution, that they be not taken when there is any thing in the constitution of the Sick, or in the condition or time of the Disease, that may forbid the exhibition of such a Medicine.

Besides the hypnoticks usual in the Apothecaries Shops, viz. Opiate, *Laudanum*, *Nepenthe*, *Philonium*, *Diacodium*, and Syrup of wild Poppies, I know two preparations of *Opium*, which I am wont to give in the form of a Tincture or more liquid extract, with any other appropriate Liquor from 10 to 20 drops.

Diet or the manner of living, to be observed by Scorbüticks in the curatory method, is not of the least moment, which being neglected or ill instituted, the other precripts of Medicine profit very little or nothing towards health: As the dietetick Rule extends it self to various things, yet chiefly it is employed about the Air, the soyl of the habitation, Meat and Drink, and the motion and rest of the Body.

As to the first, what kind of places and mansions in respect of the Heaven and Soil, do breed the Scurvy, and therefore ought to be avoided, appears sufficiently by what we have above declared. Those who studie to prevent or to cure this Disease, let them endeavour to chose and Aire moderately hot and dry, and which shall be also thin and pure and sufficiently eventilated or winnowed.

Meats only for good Juice and well cooked are convenient; heavy, slimy, putrefied, fennewed and meats dyed in the Smoak, also unfermented aliments, or greatly compounded, Pulse, Milkmeats, and unripe Fruits are to be shunned, Sweat meats or things candied, or very much imbued with Sugar, I so much blame, that I am apt to think the Invention and immoderate use of them, to have contributed very much to the cruel increase of the Scurvy in this Age. For indeed that Concreet is made up of a Salt sufficiently sharp and Corrosive, though mitigated with Sulphur, as may plainly appear by a Spagyricall *Analysis* made of it. For Sugar (as we intimated before) being distilled by it self, yields a liquor, little inferiour to the Stygian Water: for if you shall distil it, being poured to a good deal of spring Water in a Bladder, although the fixed Salt does not so ascend, yet it produces a Liquor like to the sharpest *Aqua vite*, burning and highly pricking: Therefore as Sugar being commixed almost with every aliment, is so plentifully taken in by use, it is very likely that from its daily use, the Blood and the Humours are rendred salt and sharp, and from thence Scorbütick. A very famous Author hath attributed the cause of the English Phthisick, or Consumption, to the immoderate use of Sugar among our country men, and I know no reason, but that I may rather think the increase of the Scurvy derives it self from this enkindling.

Let the Drink be midling Beer, mild and clear, and altered with antiscorbütick Ingredients, but without any ingrateful taste; let it not be thick nor sweet, nor too salt and sour, and let it be taken in a moderate quantity and almost only at the set times of Dinner and Supper: That which with many is thought a good Custom, to wit, that as soon as they are out of their beds, to indulge themselves with (as they usually say) a large mornings draught, seems to be very pernicious. For by this means, for that the sanguiferous Vessels are too much filled with the provision of fresh Chyle, almost perpetually poured in, both Crudities and morbidick Fæculencies are begotten in the Blood, and the office of Sanguification greatly weakned. It is better indeed for most men (unless such, who whilst they are empty and used to have their Ventricle grievously wrinkled and drawn together) to remain fasting till dinner, nor is it a less adversary to health according to the usual custom, to fill themselves

selves with drinking full Cups presently after Dinner. Wines or Cyder so they be mild, right and not adulterated, and moderately taken, do not hurt; but there is nothing more hurtful and injurious to our health, than those adulterated, ropie, sharp and growing soups.

Exercise and Labour is so very profitable, both for the curing and the preventing of the Scurvy, that many by this remedy only have recovered their Health, or preserved it intire. For in those leading an idle and sedentary Life, the Blood and nervous Liquor like standing Water contract a stininess and maddy settlement. But by much and assiduous motion of the Body, the Humours and the Spirits grow clear and vigorous, the excrementitious and heterogeneous Particles evaporate, the stuffings of the Viscera are discharged and their tone strengthened.

CHAP. XI.

Some Histories and rare Cases of Scorbuticks.

WHAT we have thus delivered, concerning the Theory and the Cure of the Scurvy, shall be yet illustrated more clearly by examples of sickness, or by Histories brought to light and explained according to the aforesaid Hypothesis. As there are manifold and divers cases extant of those labouring with this Disease, we shall here propose some more rare, excited by reason of the Taint being affixed in the Brain and nervous Stock, no less than in the Blood.

Observation.

A Gentlewoman, tall and handsome, about 25 years of age, had contracted the scorbutick Taint by reason of various errors in living, or manner of life, the signs of which were a spontaneous weariness, difficult breathing, pains and spots in her Legs, besides her Gums swollen and bloody; in the spring time after miscarriage falling into a tertian Feavour, suddenly she became languishing and weak, from which disease, however she had been quickly recovered, being at first methodically cured, but that greedy of flesh and other incongruous things, she soon fell into a Relapse. But then growing weary of Medicine, she took only empirical Remedies, by which sometimes her Ague fits were driven away, then soon after they returned: In the mean time she remained pale, weak as to motion, breathing short and swollen, and blown up near the Ventricle and Hypochondria. About the third month of her sickness she began to feel cruel Pains and Torments in her Belly, which afflicted her almost continually night and day, running about, now at her Back, now in her Stomach; Besides she was affected sometimes with hysterical Fits, and with a frequent Vertigo, also being troubled with often Vomiting, she daily cast forth a clammy and frothy Flegme. Within a months space this Disease displaying its ends, stirred up Pains in the Back, Loyns and then in every part of the Body. But at this time she complained of a great straitness of her Breast, and a great contraction of the Viscera. In the mean time the habit of her Body became very lean, that the Bones being destitute of flesh, the Skin could hardly stick on them. Her Urine was little and red, on whose Superficies was a little Skin coloured like the tail of a Peacock. A little time after this, she felt a stupor or numbness and a sense of pricking, sometimes in her Belly, and sometimes in her Limbs, and then the Pains and Torments began to be remitted, but in their place a Palsie succeeded, which within the space of a week so invaded the Members of her whole Body, that she could neither bend her hand or foot or any other part, nor move one jot from the place.

As to the Aetiology or the reason of the aforesaid case, this is plain that these more grievous Symptoms did wholly spring from a scorbutick Root; for by reason of the Taint being fixed chiefly in the Blood, the spontaneous weariness, the difficult breathing, and also the intermitting Feaver wavering and often returning, and other previous and as it were more light Skirmishes of Symptoms were induced: further, the lixivial Urine and of variety of Colours, plainly indicated or shewed, a Blood corrupted with a sulphureous Saline dyscrasie or evil complexion: which kind of Piss by that means well known, I have taken notice of in several others affected with the like Disease. But when the morbid Seed in this sick Gentlewoman, being plentifully increased, and flowing thorow the Mass of Blood, did spread into the confines of the

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Brain and nervous Stock, the more grievous distempers did then arise; to wit, the morbidick Matter, consisting of heterogeneous and irritative Particles, being deposited within the Brain, brought in the *Vertigo* and *Swimmings*, or turning round, and the spasmodick or cramplike Disposition; then a Portion of it falling upon the Nerves of the intercostal and moving Pair, and being by their passages cast upon the mesenterick Foldings, stirred up the scorbutick Colick; and when the same matter, being hugely increased, had come to many other Nerves, the painful Distempers were propagated almost into every part of the Body; for that the acid Recrements, like to vitriolick *Stagmat*, being deposited every where from the nervous Liquor, did encounter with the lixivial Salts, every where also poured forth from the Blood. Then lastly when all the Nerves being by degrees filled and stuffed with the morbidick Matter, were so much obstructed that the irradiation of the Spirits and their commerce were hindred, the Palsie followed upon the whole Body.

The Cure.

This Gentlewoman living far from hence, had taken Medicines by the advice of a neighbour Physician, usual against the distemper of the Colick; notwithstanding which, when the Disease grew grievous, the Patient being brought to *Oxford*, made tryal of very many Remedies, both Antiscorbutick and Antiparalytick almost of every kind and form, but without any benefit. Therefore after that every ordinary method of Curing, seemed not sufficient for this Disease, it was thought good to proceed to great Remedies, and indeed not altogether free from danger: wherefore we administered to her, as sick, weak and lean as she was, a mercurial Medicine for salivation. The effect of which succeeded to wish, for the Flux at the mouth being risen within two days, and persisting gently for many days without any evil Symptom, brought great ease to this Gentlewoman. For the Pains being mitigated, she began to move a little her Members, and to desire and to digest better her Food, and also to enjoy quiet Sleep. The Salivation being finished, she took a Decoction of *Sassa* and *China* with Antiparalytick ingredients for a few days; then being carried to the Bath, she there used for some time the more gentle and temperate Baths, and presently recovered an indifferent state of Health. All the Winter, she constantly took Medicines against the Scurvy and the Palsy, and when the following year, she repeated the use of the Baths, she grew perfectly well, and afterwards became the joyful Mother of several Children.

Observation.

A Man about 40, of a Melancholly temper, labouring for many years with the Scurvy, was wont to be sensible of divers and manifold Symptoms of it, at several times of the year. There appeared about his Thighs Spots and black large marks as if coming of strokes; pains of the Belly, with a Looseness often troubled him; his Urine for the most part appeared like Lye, and he almost constantly had a spontaneous weariness, a failure of his strength, and a want of Appetite. Besides these ordinary evils, and as it were customary, he lived obnoxious to most cruel Fits of Sickness, and those of various kinds. Two years before, when I first saw him, he complained most grievously of a difficulty in Breathing, as if he were in danger to be choaked, with a trembling of the Heart, with a fainting of the Spirits, and of a constant fear of Swearing. Besides, if any of these Distempers in the *Præcordia* ceased a little, for the most part an heavy giddiness in the head, and *Vertigo* assaulted him. After that he had taken for some time Antispasmodick and Antiscorbutick Remedies mixed together, he seemed to be perfectly well; but then within a few weeks he was affected with a nausea and pain about the Heart, with an inflation of the *Hypochondria*; his Urine was little and very lixivial, and shortly after the *Abdomen* swelled up, and then his Feet and Legs with a great waterish swelling, shewed the signs of a growing Dropsy: afterwards the same Tumour invaded the flesh of his Thighs, Arms, and Back also: which Distemper however though it seemed desperate, was easily cured with antiscorbutick Remedies, with the addition of Catharticks and Diureticks. But yet this remarkable person, although he was restored to health, did not continue so long: for two quarters of the year were scarcely past but he began to complain of a grievous Head-ach, with a *Vertigo* and a pertinacious waking, and then without any evident cause, he was taken with most horrid Vomiting: a little while after, his asthmatical fits, with the trembling of his Heart and sinking down of his Spirits, returned. Also at this time, when he almost seemed desperate, he again grew well in a little while, with the use of antiscorbutick Medicines. It plainly appears by this case, how many evils the scorbutick infection, like to Ferment lying hid both in the Blood and nervous Juice, and as occasion serves, spreading abroad its *Boylon*, can cause; which kind of distempers, how horrid and terrible soever they seem, whilst they depend only of the Humors vitiated in their Complexion, and that the *Viscera* are not at all hurt in their Tone or Conformation, are wont to be cured most

most commonly very easily, or without much trouble, viz. with an antiscorbutick Method aptly designed, both according to the condition of the Patient, and of the Disease. PHAR. Part. II.

Observation.

A Lady about 25 years of Age, of a sanguine Complexion, of a slender make of Body, of a fair skin and beautiful, had laboured for some time with the scorbutick distemper; for besides broad spots and red swellings breaking forth in divers parts of her body, she was wont to be troubled of a long time with cruel pains and torments, chiefly vexing her at nights, sometimes in her Legs and sometimes in her Arms: She had often begun to take Physick for the Cure, but being with Child was forced to give it over. After her last Child, for that she had great fluxes, she remained for many days languishing and weak, with difficulty of breathing, and upon any motion breathless. Being risen up after lying in her month, and endeavouring to walk she fell into a most grievous *dyspnœa* or shortness of breath, with the trembling of the heart and a frequent fainting or sinking of the Spirits: Being presently put to Bed, yet trembling and with quick palpitations, she continued so for almost a whole day; besides her lower Members as if they had been dead, were altogether stiff and cold, and could not be made warm with the applications of warm cloaths or by rubbing: At length the night being almost past, she found her self better about her *Præcordia*, strong Cordials having been often administered to her, but there succeeded a very acute pain on the top of her Thigh nigh to her left Groin, reaching even down to the Calf of her Leg, and within a few hours a hard tumour resisting the touch possessed all that space. Being sent for at this time whilst the sick was gaping for breath, a Clyster being prescribed and taken, I gave her 12 drops of the Spirit of Hartshorn, in a spoonful of the following Julap, 3ij of the same being drunk afterwards. Take of the water of Snails 3vj, of hysterical water 3iiij, of Walnuts simple and of Pennyroyal each 3ij, of Sugar 3j, of *Castor* tied in a Rag and hung in the Glass 3j. These Medicines were repeated every sixth hour. I took care to have a large Vesicatory to be applyed to the inward part of her Thigh, then in the evening for that she had continued all this fit without any sleep, I gave her j grain of *Laudanum*, of the powder of Pearls vj gr. of the Confection of *Alchermes* without Musk 3ib. She slept quietly, and in the morning was very much refreshed, the pain and tumour of her Thigh were somewhat abated, also while she lay quiet in her bed she was well at her *Præcordia*, but if she sat up or turned of one side, she presently seemed as if she would expire with the *dyspnœa* or want of breath. She continued to repeat the use of the Hartshorn and Julap every sixth hour for some dayes: but because she was oppressed with a troublesome thirst, and that her Urine was little and the Contents red and high coloured, she took a dose to 3vj, twice aday of the following *Apozem*. Take of Græs Roots, Chervil, *Eringo's* preserv'd, each 3vj, of the shavings of Ivory and of Harts horn each 3ij, of Hartshorn burnt 3ib, of Raisins of the Sun 3ij, 1 cut Apple, of Liquorish 3iij, being cut and bruised let them be boyled in 3 pints of Spring water, to the consumption of the third part; then add of Whitewine 3iiij, let it be strained into a Jugg, to which put of the leaves of Scurvygras and of Brooklime each m. j, of the Salt of Wormwood 3ij, make an Infusion close shut and warm for 3 hours, being strained let it be kept in close Vessels: Sometimes every day, sometimes every other day they gave her Clysters. By the daily use of these she seemed to be better, so that within the space of a Week she was able, being raised from her bed, to sit up in a Chair by the fire side for 2 or 3 hours: But if she sat up a little too long, or did but endeavour to stir, she presently fell into an asthmatical fit or *dyspnœa*; so that one day having stayed somewhat longer out of her Bed, having suffered a most heavy assault of the Disease, she was afflicted with a difficulty of Respiration, with a trembling of her whole Body, and continual sinking of her Spirits: By reason of this Relapse of the sick Lady, at last I being sent for, gave her 20 drops of the Spirit of Hartshorn with the above prescribed Julap, and at night a dose of our *Laudanum*; but when she began to be better about her *Præcordia*, the pains and tumors succeeded in her right Thigh and Leg as had happened before in her left: I also ordered a Vesicatory to be applyed to that Thigh, and besides the Remedies hitherto cited, she took twice aday of our Wine of the Juice of Scurvygras 3iiij, with 3ij of the magisterial antiscorbutick water. Besides I ordered a Purge of our solutive Syrup above prescribed, which succeeded so well, that I repeated it again within 3 or 4 days. With these Remedies she grew well within a Month.

As to the Reasons of the Symptoms observed in the aforesaid case, first it is obvious from the spots and pains of the Limbs, that the Blood and nervous Juice had been for a good while touched with the scorbutick taint, which notwithstanding lay hid within the aforesaid humours, as it were subjugared and without any signal evil, so

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so long as they were strong in the Vital and Animal Spirits: But after the great hæmorrhage or Flux of Blood, when the Blood and nervous Liquor grew weak in their *Crafsis* or Complexion, the particles of the morbid feed like to ferment, being moved, stirred up those terrible distempers: That grievous *Dyspnœa* or want of breath, seemed to arise from a double cause, or a concurrence of a double evil; to wit, because certain pneumonick Nerves being beset with the scorbutick matter, were hindered as to their office of Respiration: For from hence there was a necessity that the Lungs should be swiftly moved, that they might draw the Blood from the heart, and the act of Respiration being more weak by reason of the Nerves being hindered, it became therefore more short and very laborious: A fit of the *Dyspnœa* urging, when as the Blood about the *Præcordia* was very much agitated, the extreme parts (which were then almost wholly wanting) by reason of its absence grew stiff and cold; afterwards when as the Spasms or Convulsions of the Lungs abated, that the Blood being greatly embued with the morbidick matter, which it had there supped up, loosned from its stagnation, was returned to Circulation, that rushing impetuously into her Thighs, first into her left, then into her right, the other being deserted and so overflowing its Channels, being extravasated with the serous filth, caused that sudden ramour with the red swelling. But by reason of the shifting of the morbidick matter into the more ignoble parts to and again, the Disease though it seemed very dangerous, easily gave way to Remedies, altering the dyscrasies or evil dispositions of the humours, and gently carrying away the Reliques of the morbidick Mine.

Observation.

A Noble gentleman about 33 years of Age, of a sanguine Complexion as he seemed to be, tall and slender, of a very sharp wit and great understanding, although he had exercised himself very much for a long time in immoderate and unseasonable studies, together with an inordinate way of living, yet to that time being fresh and full of vigor, he seemed to enjoy a whole mind in a sound body; a little more than two years before, when he had very much tyred himself in dancing a whole night amongst his Guests, in the morning going into a cold Bed in a Chamber somewhat moist, desirous of a little Sleep he began to be Sick; for being awaked he fell into great perturbations about the *Præcordia*, with great fainting of the Spirits: After having taken a draught of Wine and some Cardiack Remedies, he was somewhat better; but by and by he relapsed, so that both himself and his friends feared all that day a mortal swooning or an imminent Apoplexy. But after this Assault of the Disease had passed over, he lived after that still obnoxious to daily passions of the Heart, and upon any more great error in living, he was wont again to be troubled with most grievous fits. Notwithstanding the use of Remedies, the Disease encreasing upon him within a few Months, it not only infested the *Præcordia*, but in the whole habit of his Body, Suffusions sometimes of cold sometimes of heat, and besides a *stupor* or numbness, or sense of tingling or pricking, or light and sudden Convulsions or Contractions in his Limbs were excited: And of late besides these Symptoms spoken of already, which although they were very grievous to this Noble Gentleman, yet he was further troubled after a terrible manner with a frequent *Vertigo*; and with distractions and decay of the Spirits, that inhabit the forepart of the Brain, insomuch that he was forced to abstain from Studies and Political Affairs (to which he was always addicted) yea and from every more serious intention of the Mind; for otherways he felt those sort of perturbations both in the Head and in the Nervous Stock, that made him fear an Assault of the astonishing Disease, or most horrid convulsive Affections: Whilst he had the more grievous Fits of this Disease, his Ventricle also was disturbed for the most part, but he often received ease by Vomit, either by the free assistance of Nature, or by the help of an emetick Medicine. Hence some thought the cause of the Disease, to subsist altogether about the Stomach or the *Hypochondria*, but Catharticks, Emeticks, Digestive, Cephalick, Anti-scorbutick, Chalybeate, and other Medicines almost of every kind, prescribed him for two years by the most famous Physicians, and also by Empiricks and Quacks, profited little towards the Cure of the Disease. Of late having tried *Astrop* waters, he found himself worse for the use of them, presently desisting, he was next advised to be carryed to the sulphureous waters at *Knaresborough* in *Yorkshire*, but with what success I have not as yet learned.

This case because by reason of the Concurrence of various Symptoms, it can belong to no other kind of Disease besides, it is not undeservedly referred to the Scurvy; for it may be suspected that the procatartick or Remote Cause of this Sickness, lay in the evil disposition of the Blood, to wit, that its Liquor was degenerated from a Balsamick and a spirituous, into a sharp and sulphureous-saline, by reason of these Elements being carried up above measure, which indeed seems to have happened partly from Errors in living, for that this Noble Person being often kept by business or more serious

serious Studies even till Midnight, was wont to sup at that time, and presently to go to bed to sleep : Further, this Disease did partly arise from a sickly disposition of the Spleen, and perhaps of the other *Viscera*, supplying the Blood with a morbid ferment, neither is it altogether without reason, that we judge the Spleen should be accused.

P H A R.
Part. II.

The Blood labouring with the aforesaid Dyscrasie, and from thence gathering together heterogeneous Recrements, easily poured the same on the head, being helped by the evident cause : Wherefore when the Brain by reason of immoderate and untimely studies, being something debilitated became less strong to resist the evils, and when for that occasion before cited, the bloody Mass being carried up into a greater ebullition, the pores of the whole Body being by and by shut up, it could not be so well eventilated, its great suffusion or spreading into the head brought on the first manifest sickness, to wit, from the Blood too much heaped up about the region of the Head, first the swelling up and *Phlogosis* or inflammation of the Face came : Further, from the same at that time impetuously rushing on the borders of the Brain, and there stagnating the heterogeneous Particles, partly Narcotick, partly explosive, fell down into the Origin of the Nerves, which being so beset with incongruous matter, those perturbations stirred up about the *Præcordia*, (for the Reasons shown in the spasmodick Pathology) did succeed. Further, for as much as the same matter being dilated towards the hinder part of the head, coming upon the Nerves, arising from the spinal marrow, it invaded the extreme passages and processes of them all, and stirred up through the whole Body, a *stupor*, pricking, and the lighter Cramps or Convulsions. Moreover, because the Nerves and their branches compassing about the sanguiferous Vessels, being affected with Convulsions were variously contracted, those sudden diffusions or spreadings of heat and cold, by reason of the Bloods being as it were sometimes restrained with a Bridle, and sometimes agitated forward with a Spur, did arise through the whole Body.

About the beginning of the Disease, because the morbidick matter being suggested from the Mass of Blood, breaking forth first either on the Region of the Cerebel, or if admitted into the Brain, being from thence presently sent forth, it fixed chiefly about the original of the Nerves, therefore the chief taint appeared in the nervous Appendix, and about its exterior processes without any *Verrigo* or previous swimming or Scotomy, or any notable hurt in the chief powers of the Soul : But afterwards by reason of the dyscrasie of the Blood being daily encreased, and the constitution of the Brain or *Encephalon* being more weakned, the heterogeneous Particles also breaking through into the anterior Brain or the regal Palace of the Soul, they brought on both the distractions and meltings or sinking down of the Spirits inhabiting there : So that this Disease after that its Roots being once planted somewhere within the *Encephalon*, did daily shew its intentions, notwithstanding the use of Medicines, as that at first only the original of the nervous wandering pair, and the intercostal were infected, and then afterwards the morbidick matter entred into the processes and interior passages of the other Nerves of the whole Body, which being filled full, at length that being carried by the as yet impure Blood into the Brain it self, it possessed its more noble Cells, which kind of Cephalick Distempers, I have observed to have made the like progress in many, so that it plainly appears these Symptoms excited by such a Series, arise by reason of the aforesaid Causes, and not from Vapours supposed to be elevated from the *Viscera* or Inwards.

But that a fit urging oftentimes the Ventricle was disturbed, also that it was wont to be suddenly eased by Vomit, it will not be difficult to shew the reasons without prejudice to this *Hypothesis*. As to the first, there is nothing more plain than that the Ventricle is subverted, and that a nausea or Vomiting doth succeed, by reason of some grief inflicted on the Origin of the Nerves, as we have at large already declared, then there is more reason for that Vomiting should bring present help : For in the first place, as the Nerves of the wandering pair and the Intercostal are very much shaken, (as it is the manner of the Nervous Parts) they presently remit their inordinations excited from an internal cause, as an itching or pained member is freed from grief if it be scratched or rubbed. But the aforesaid Nerves being greatly shaken together and contracted in Vomiting, they easily shake off the morbidick Matter, fixed to their ends or extremities ; by which it comes to pass, that oftentimes a sharp or acid Matter, or otherwise infestous, being heaped up within the first Passages, and there either infecting the Blood, with its hurtful Ferment, or irritating the nervous Bodies, into Convulsions, is brought away by Vomit, and so the Fountain or Provocative of the Disease is carried forth.

PHAR.
Part. II.

As to the therapeutick or curatory Method, to be used in this case, and others like it, there are two intentions which are chiefly to be insisted on; *viz.* In the first place to make pure the Mass of Blood, and to bring away the noxious Ferment administered from the Ventricle, Spleen, and other *Viscera*. Secondly, that the Brain and nervous Stock be strengthned, lest they admit of extraneous Particles: and that the nervous Juice watering those parts, degenerating from a right into acetous or otherwise morbid *Crafsis*, may be rectified and restored. The first of these are to be performed by Catharticks, Emeticks, Phlebotomy, and chiefly by specifick Medicines, correcting the scorbutick Taint of the Blood, or carrying it quite away: But as to this Iron or Vitriolick Spring, celebrated for the purging the Blood, that they were rather hurtful than helpful to this Gentleman, the cause seems to be, both for that the Brain being made weak by reason of those Cephalick Distempers, hardly excluded the filth of the Water sent from the Blood, but was in danger to be overflowed, by its falling more furiously upon its Confines; and also because when the nervous Liquor degenerating from its *Crafsis*, turns sower, it is wont to be more preverted by the fluid Salt of those purging Waters. Wherefore we have still observed, that the drinking those Waters, in a Rheumatism and the Gout, hath increased the morbid Disposition. The second intention is best instituted by cephalick Remedies, and chiefly those indeed with a volatile Salt, of which sort are Spirits, and Salt of Blood, Soot, and Harts-horn, of the Roots and Seeds of Peony, the leaves of Mistletoe, &c. With which Antiscorbuticks may be mixed.

F I N I S.

T W O
DISCOURSES

CONCERNING

The Soul of Brutes,

Which is that of the

Vital and Sensitive of Man.

The First is **PHYSIOLOGICAL**, shewing the **NATURE**,
PARTS, **POWERS**, and **AFFECTIONS** of the same.

The Other is **PATHOLOGICAL**, which unfolds the
DISEASES which Affect it and its Primary Seat; to wit, The
BRAIN and **NERVOUS STOCK**, And Treats of their **CURES**:
With Copper Cuts.

By **THOMAS WILLIS** Doctor in **PHYSICK**, Professor
of Natural Philosophy in **OXFORD**, and also one of the Royal So-
ciety, and of the renowned College of Physicians in **LONDON**.

Englified

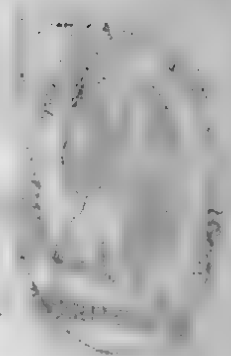
By **S. PORDAGE**, Student in **PHYSICK**.

L O N D O N,

Printed for Thomas Dring at the Harrow near Chancery-Lane End in Fleet-
street. Ch. Harper at the Flower-de-Luce against St. Dunstan's Church
in Fleet-street, and John Leigh at Stationers-Hall. 1683.

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Report to the



of the

The following is a list of the names of the persons who have been admitted to the membership of the Church since the last meeting of the Synod. The names are given in the order in which they were admitted.

The names of the persons who have been admitted to the membership of the Church since the last meeting of the Synod are as follows:

and John Lewis of Stationers Hall, London.

To the most Reverend Father in God

GILBERT

(By Divine Providence)

Arch-Bishop of Canterbury,

Primate and Metropolitan of all *ENGLAND*, and one
of the Privy Council to His Sacred Majesty *CHARLES* the
Second, King of Great Britain, France, and Ireland, &c.

Most Renowned Prelate,

IN that I still become troublesom to your greater
Cares, by this Kind of often repeated Duty,
I must also repeat my former Excuse. For
that these my *VV*ritings, with those formerly
Published, for the most part consist of those
things which I have delivered in my Academical Read-
ings, by a necessitated Duty belong to you, for that I recei-
ved them from your Favours; and indeed, neither these
had ever seen the Light, nor perhaps my self had ever
been in the number of Authors, unless I had been made at
first your Sidlie Professor at Oxford; yours I say, both for
the ancient Honour with which you had advanced me, and
also for the more fresh magnificent Liberality, which has ob-
liged the whole Academy, and all its Gowned Company.
All the Schools partake of what is imputed to your Thea-
tre; and moreover all the Professors, whilst every one of
their private Patrons are acknowledged, Celebrate Sheldon;
who exceeds, by your gifts that of other Mecænatuses, and
Crowns the whole.

But as these Disquisitions are indebted to your Munifi-
cence, so they require your Patronage, and we offer them
not more in Duty to your Grace, than for the Cause of your
Tutelage.

Tutelage. Concerning the Soul, I have enter'd upon a great and difficult thing, and full of hazard; where we may equally fear the Censures of the Church, as the Schools. For that I assert a Man (as the Mad-man in the Gospel possess'd with a Legion) to be indued with many distinct Souls, and design sometimes a legitimate Subordination of them, and sometimes wicked Combinations, troublesom Contests, and more than Civil Wars; yea, and in that I importunately describe, the Manners and Affections, the Mutual Exaltations, Dejections, and Productions of either, and their state after Separation: These, I say, some not only Philosophers, but Theologists perhaps may find fault with. And altho I have a place of Safety, in that the Arguments and Reasons fight on my Side, and that I have got the Suffrages of the ancient Philosophers, and the holy Fathers (and especially of St. Hierome and Augustine, and among the Moderns of Gassendus and our Hammond) yet suffer your Grace for my greater Safety, to extend your help to me, and grant that I may profess in the Entrance to this Discourse, that I am

Your Graces

Most humble and devoted Servant

Tho. Willis.

To the Most LEARNED and WORSHIPFUL

By me ever Respected

*The Vice-Chancellor, Doctors, and Masters, who
diligently Profess, greatly Adorn, and happily Promote good Letters in the
most Famous University of Oxford, Health.*

EXcuse me, Learned Men, if you, who were once my Auditors, I now desire to be my Readers, and you whom I ever found Propitious and Favourable, that I therefore wish you may be my Judges and Patrons. Your singular Humanity hath formerly enflamed my Industry, in this Physiological Undertaking, and given me Life and Strength; so that if that any thing of Praise be due to me, it ought to be imputed and referred to you. I know indeed how great difference there is, betwixt the flying words of Speakers, and those impress'd upon lasting Papers; but it seems of great Authority, that they have not been displeasing to your most Curious Judgments, in their utterance, and I hope they may now pass any Examen, having already passed your Critical Ears. It therefore belongs to you to defend, if not these my Endeavours, yet at least your own Judgments; and if perchance, the literate *Thrasoes* of this Age, who are wholly ignorant in Philosophy, every where wandering about, attempt to overthrow me with their Clamors, which is their chief Eloquence, to oppose your Authority against them, by which, if they are not put to Silence, it will be however an high Confidence and inviolable Security to

Honored Sirs,

the Admirer of you all,

THO. WILLIS.

THE

THE PREFACE TO THE READER.

Courteous Reader,

I Have here given you what I had long promised, the Pathology of the Brain and Nervous Stock, and with it the previous Physical Meditations of the Soul of the Brutes, which is that inferior one of Man. This difficult task, when at first denied leisure and retirement, it could not be performed; after the Death of my Dear Wife, being lonely, with frequent and unseasonable Studies, that I might the less think on my Grief, I have at last finished this, according to my slender Capacity. But indeed in these Disquisitions (which the Anatomy of the Brain, and its Appendixes, hath lately and more exactly shewn) as we have enter'd into a by-way, and not before trodden, there was a necessity to lead thee, thorow some sharp and stony ways, beset with bushes and thorns, which might offend thee. And indeed I know not, whether it will be pleasing to all, that instituting the something Paradoxical Doctrine of the Animal Soul, that I should assign to that Soul, by which the Brutes as well as Men live, feel, move, not only Extension, but Members, and as it were Organical Parts, yea peculiar Diseases, and proper means or methods of Curing them; and that moreover, I should form this, which is meerly Vital, and different from the Rational, and subordinate to it, and so Man, a Two-soul'd Animal, and as it were a manifold Geryon.

That I may remove out of the way these little rubs, I do not at all doubt to overcome them, and evince the Corporeity of the Soul, by Reasons not to be contemned, and also by the full suffrage, both of the Ancients and the Moderns; and besides, that it is Bipart or Twofold, I have already, in another place, by a necessary Consequence deduced, from the Life of the Blood, as it were a flame, and from the existence of the Animal Spirits, and as it were lucid or ætherial Hypostasis, asserted and proved. For granting to the Soul, one Vital Portion living in the Blood, to be a certain inkindling of it, and another Sensitive, to be only an heap of Animal Spirits every where diffused thorow the Brain and Nervous Stock; it follows from hence, that Brutes have a Soul Co-extended to the whole Body, and Parts not only many and distinct, but after a manner dissimilar. But that some object, that the Soul of the Beast, because it perceives, or knows that it feels, to be immaterial, for that Matter seems to be incapable of Perception, that indeed, had been likely, if that Perception should pass beyond the limits of Material things; or higher, than what inspires them, which things are usually attributed to Natural Instinct, or Idiosyncrasy or peculiar Temperaments, that I may omit Sympathies and Antipathies. But who should be the Betrother? I profess the great God, as the only Work-man, so also as the first Mover, and auspiciously present, every where, was he not able to impress Strength, Powers, and Faculties to Matter, fitted to the offices of a Sensitive Life? The Pen in the hand of the Writer, Disputes, Intreats, gives Relations of things, and is in the midst between things past and things to come; and why should we not believe that greater things than any of these, may be done, when the Skill
of

The Preface.

of the Deity is present? Lastly, If any one shall affirm, that most subtle Substance, and wholly Etherial, which serves for the Vital Oeconomy or Government to be immaterial, for that it enters upon the sluggish Disposition of inanimate Bodies; let him remember to be indulgent to me, if by chance I call it material; for that it subsists very much below the Prerogatives of Reason.

But I shall not stand upon these things, for truly I have prepared a far other-gates defence; to wit, I speak not from the Tripod like an Oracle, nor from the Chair, but as one of a low form: I play not the Prophet, or Dictator, but the Philosopher, neither do I plant an Opinion, but propose an Hypothesis, and open my Judgment. Geometry has its Demonstrations in it self; we are Skill'd in that part of Philosophy, where it abundantly suffices to have brought Logical Proofs: Surely he only certainly pronounces, who professes his Errors, and whilst he Philosophizes about Man, remembers himself that he is a Man.

But that according to the Adage, that I should declare some to be rather sick in Soul, yea first, and chiefly than in Body; otherways than the Schools of Physicians, which refer the Primary Seats of all Diseases, into solid Parts, Humors, and Vital Spirits, or innate Heat: I say from our Hypothesis, to wit, that this Soul hath a material Subsistence, extended equally with the Body, and peculiar Parts, Powers, and Affections; may be concluded, that it is found obnoxious also to preternatural Diseases, and not seldom wants Medical help.

Moreover, That the Corporeal Soul doth extend its Sickneses, not only to the Body, but to the Mind or rational Soul, which is of an higher lineage, and that it often-times involves it with its failings and faults, I think is clear enough in our Pathology or Method of Curing. Further, for the proving these two distinct Souls, to be together and subordinately in Man, as much as Authority and the force of Reasons can, I think is there proved; which Opinion is so far from that I need so fear it should be censured for Pernicious or Heretical; that on the contrary, we hope it is altogether Orthodox, and appears agreeable to a good Life, and Pious Institutions: from hence the Wars and Strivings between our two Appetites, or between the Flesh and Spirit, both Morally and Theologically inculcated to us, are also Physically understood; for that, I see and approve the better things, and follow the worse; and this, The Flesh lusts against the Spirit, and the Spirit against the Flesh. So generally comes to pass in us, for as much as the Corporeal Soul adhering to the Flesh, inclines Man to Sensual Pleasures, whilst in the mean time, the Rational Soul, being help'd by Ethical Rules, or Divine favour, invites it to good Manners, and the works of Piety. Further, from hence, the chief Argument is brought against Epicurism, and Atheism, for that it is moved by the force of Reasons, our Sensitive Soul even as that of the Brutes, miscarrying, the other perpetually survives; for truly being perswaded of an after and Eternal State, why doth it not make it its whole business, that it may live more happily in it, or at least not miserably?

But also, that it may be objected, that there cannot be therefore two Souls in Man, because many forms cannot actuate at once the same Matter; It may be answer'd; that the Supream form of the same Subject, doth sometimes subordinately include many others, but specifies it only a Compound. Also, the Corporeal Soul being subordinate to the Rational, subsists immediately in the Humane Body, and this Superior is in the same, that mediating. It would be a much more difficult solution of this hard Business, if the Inferior Soul of Man, common to that with the Brutes, should be also affirmed to be immaterial; for by what knitting together, can two independent Souls subsist in the same Body; being from thence separated and Combined, by no common Bone, into what place can they depart severally? Certainly as to reason, it is more probable, and to the Humane government more agreeable, to affirm that one most subtilly Corporal Soul, is joyned immediately to the Body, and is intimately united, and that by the intervention of this Soul, another immaterial, residing in its Bosom, inhabits the Body, and is the supream and principal form of the whole Man: But that after Death, the Corporeal Soul being extinct, this survives and is Immortal.

That

The Preface.

That the Corporeal, Flameous, and lucid Nature of this Soul, and its Parts and Affections, may be the better known, I have thought it necessary to describe the Vital Organs, both of all Kinds of living Creatures, by the Action of which the Lamp of Light is maintain'd; and also to shew plainly laid open, even to their intimate recesses, and least and secret Passages, the Brains, both of the more perfect Brutes, and also of Man. The Anatomy of which being manifold; not being able to perform it only with my own hand, and Skill, being also almost continually interrupted by my Practice, the Famous and Skilful Anatomist and Physician Dr. Edmond King was much helpful to me, by his assiduous and notable assistance and labour. Also that learned Man, and my most intimate Friend, Dr. John Masters, Skilful in Physick and Anatomy, imployed much of his Labour and Diligence in the same Business. Out of this various Zootomie or Anatomy of the more perfect Beasts and many-flower'd dissection, the wonderful things of God are very much made known, for as much as in every the smallest and vilest little Animals, not only the Face and Members, but also the inward Parts, as it were the Hearths and Altars for the continuing the Vital Fire, shew them to be of a most Elegant and Artificial and plainly Divine Structure.

As to our Pathology or Method of Cure, I must confess, that in delivering the Theory of Diseases, leaving the old way, I have almost every where brought forth new Hypotheses: but what being founded upon Anatomical Observations, and firmly stablished, better solve all the Phænomena of the Sick, (viz.) They declare more aptly the Causes of the Symptoms, and shew the Reasons of Curing, more accommodate to every Disease. But as to the Remedies and Therapeutic Method, altho we follow not exactly, after the manner of others, the Ancients, we have nevertheless rejected nothing ratified by grave Authority, or approved by daily Experience; and besides, we have added many things found out Emperically and Analogically by the Moderns; Altho it is neither our Hope or Ambition that these should be pleasing to all; yet (what is my last wish) I doubt not, but that this may be an help to many for the illustrating the Medical Science, and for the more happy Curing of Cephalick Diseases. Farewel.

O F

The Soul of the Brutes,

The First Part

PHYSIOLOGICAL,

SHEWING,

Its NATURE, PARTS, POWERS, and AFFECTIONS.

CHAP. I.

The Opinions of Authors both Ancient and Modern are recounted.

With what Pleasures, and with what Delight, beyond other things, the Contemplation of the Soul hath drawn to it self the Wits of Men, and most profoundly Exercised them; appears even from hence, that almost none of the Philosophers, of whatsoever Sect they were, and of every Age, who have not laboured in the search of it: But indeed, how hard and abstruse it is, and with what dark Blackness, not less than the shades of Hell it self, this Knowledge of the Soul is over-shadowed, may be gathered from this; because they are opposite and uncertain, concerning it; yea, almost as many Men as there are, so many several Opinions have they Published; that truly 'tis no unjust Complaint of the Soul, that she understands all things but her Self. Nevertheless, in this Age, most fruitful of Inventions, when that so many Admirable things not before thought on, as it were another Ancient World unknown, are discovered, about the building of the Animal Body, when new Creeks are daily found out, new humours spring up, and altogether another Doctrine than what hath been delivered by the Ancients, concerning the use of many of the Parts, hath been instituted; why may we not also hope, that there may be yet shewn a new disquisition concerning the Soul, and with better luck than hitherto? Therefore, however the thing may be performed, I shall attempt to Philosophise concerning that Soul at least, which is Common to Brute Animals with Man, and which seems to depend altogether on the Body, to be born and dye with it, to actuate all its Parts, to be extended thorow them, and to be plainly Corporeal; and that chiefly, because, by the Nature, Subsistence, Parts, and Affections of this Corporeal Soul rightly unfolded, the Ingenuity, Temperament, and Manners of every Man may be thence the better known; as also the Causes, and formal Reasons of many Diseases, as of the Phrensie, Lethargy, Vertigo, Madness, Melancholy, and others, belonging rather to the Soul than to the Body, as yet hidden, may in some part be discovered: Then Secondly, because the ends and bounds of the aforesaid Corporeal Soul being defined, the Rational Soul, Superior and Immaterial, may be sufficiently differenced from it; nor is that Argument admitted so easily, confounding them together, whereby some deserving very ill of themselves, have affirmed the Souls of Man and the Beasts only to differ in degrees of Perfection; and so that either alike must be either Mortal or Immortal, and alike propagated *ex traduce* or from the Parent. Wherefore that the Dignity, Order, and Immortality of the Rational Soul, discriminated from the Corporeal, may be vindicated, and likewise that we may make a way to the remaining Pathology, or Method of Curing of the Brain and Nervous Stock, in which not only Parts of the Body, but often the animal Spirits, yea, sometimes the whole sensitive Soul, seems to be affected, (altho we have formerly unfolded according to our slender Ability, not after this manner, the Descriptions and Uses of the Brain and Nerves.) Therefore at present, we

The Contemplation of the Soul pleasant but difficult.

It Conduces to the knowing of the Manners of Men, and the Diseases of the Soul.

It distinguishes the Rational Soul of Man, from that other of the Brute.

shall endeavour to deliver a certain Doctrine of the Soul, previous to the shewing the Doctrine of the Diseases of those Parts. But here it will be first expedient to rehearse the Opinions of others, or at least the chiefest and most noted among them: From which, being put together, if not what the Soul truly is, may be made known; yet what many considering it have thought of it; and from thence a little more certain search of it, we may enterprize.

Some have affirmed the Soul of the Beast to be an Incorporeal Substance; to wit, the Platonists, and the Pythagoreans.

And indeed if we would grow wise concerning the Soul only out of the Pleas of Authors, and the Writings of Philosophers of every Age, we should be intangled in a Labyrinth of Opinions, following for truth mere Phantasms, and for the genuine Idea of the Soul, as it were the Apparitions of divers Specters. But that we may reduce the various Opinions, whatever have been declared, both of the Ancients and Moderns, to some certain Heads; it will be that we observe, some did affirm it to be Corporeal, others Incorporeal. In either Kind we meet with great diversity of Opinions. For first of all, among those who thought it Incorporeal, some affirmed it to be a Substance existing of it self and immortal, others without Substance having only an accidental form. Those who believed the Soul an Incorporeal and Immortal Substance, differed also among themselves. The *Platonists* and *Pythagoreans* said, the Souls of all living Creatures, to be a certain Part of the Universal Soul of the World, and that they were depressed or immersed in this lower Body, as in a Sepulcher; and therefore, the Soul, when the Animal received Life, was not born but dyed; for as much as by this inferior Birth, it was divided from the simple and undivided fountain of Nature. Further they thought, that the same Soul so demersed, did wander from one Body being dead, to another, and so by a various *Metempsychosis*, did inhabit or was a guest sometimes in the Bodies of Men, and sometimes of Beasts. The *Manichees* asserted, That all Souls being taken out of the Substance it self of God, did actuate Terrestrial Bodies; and going from hence again, returned into God himself. The *Origenists* different from either, taught that Souls were Created from the beginning of the World, and at first to subsist of themselves, then as occasion serv'd, that Bodies being formed, they enter'd into them being begun, and actuated them during Life, and that at length they returned to their private or singular Substances. The state of which Souls, tho some attributed it only to Humane Souls; yet there were others, who granted the like Immortality to the Souls of the Brutes, yea and of Plants.

Cap. 2. de Nat. Hom.

Others an Incorporeal form as the Peripateticks.

On the contrary, *Nemesius* (but untruly) saith, That *Aristotle* affirmed the Soul to be Incorporeal, but without Perfection and Mortal, when he had designed the *Entelechia* or Perfection of every living thing; as to wit, She as it were arising up of her own accord, from Power only of matter rightly disposed, understands nothing else, but its own Crasis or Temperament, resulting from the mixture; which as it adds nothing substantial to the præexisting Matter, the Soul it self seems to be from thence a mere *Eus* of Reason, and only an extrinsical denomination. Further, when the *Peripateticks*, from the Soul raised up out of the Grave of Matter (which they affirmed to be a simple form, without Extension and divisibility) do contend that the Members of the same Body, do perceive many things at once and together, they have introduced into the Schools that Plea or rather Riddle, to wit, That it is whole in the whole, and whole in every part. To this Opinion thus unfolded, that of *Dicaarchus* was a-Kin, who said the Soul was *Harmony*, and also that of *Galen*, who call'd it a *Temperament*.

Others affirm the Soul to be Corporeal, and either something out of the Elements or the Blood, &c.

Nor do we meet with a less diversity of Opinions, among the Philosophers of every Age, delivering that all Souls, or all others, the rational excepted, are Corporeal. To pass by those who have affirmed the Soul to be either Fire, or Air, or Water, or something made out of many of these Elements; some, as *Critias* and *Empedocles* have said, that it was *Blood*. Which Opinion the Sacred Scriptures in some places plainly favour, where the eating of Blood is forbidden, because it is the *Life* or the *Soul*: Moreover, there are not Reasons and Arguments wanting, which conclude this to be very near, or very like to Truth; as shall be shewn anon.

The Opinion of Epicurus, that the Soul is made out of Atoms.

To these may be added, the Opinion of *Epicurus* delivered of old, and of late revived in our Age, which introduces the Soul plainly Corporeal, and made out of a knitting together of subtil Atoms, and asserts, citing *Laertius*, ὅτι ἡ ψυχὴ, &c. which according to the mind of *Gassendus*, is as much as to say, That the Animal is as it were the Loom, in which the Yarn is the Body, and the Woof the Soul. From thence *Laertius* describing more fully its Corporeity, saith, ἡ ψυχὴ, &c. which is, that the Soul is Composed of most light Atoms, and round, not much different from those out of which fire is. Other *Epicureans* describing the Nature of the Soul, otherways, depaint it as from something hot, flatuous, and airy, we need not to unfold any further this Opinion, nor shew out of *Laertius* and *Lucretius*, by what Rite the Assertors of the *Epicurean* Philosophy, do accommodate such an Atomical Composition of the Soul, to all the Actions and Affections of the Function, or Animal Government, which are to be performed. Upon

Upon this Hypothesis of the *Epicureans*, as it were its basis, the Philosophers of this latter Age have built all their doctrines of the Soul, tho very divers, and I may almost say opposite. For as the soul of the Brutes, is affirmed by most of them, to be Corporeal and divisible, yet she is by some of them deprived of all Knowledge, Sense, and Appetite; in the mean time, not only Sense, Memory, and Phantassie is granted to her by others, but the use of a certain inferior Reason. And what is more to be wonder'd at, the same end of their Assertion is propos'd by either Sect; to wit, That the Soul of the Brutes, both as it may be deprived of its gifts, and also as it is most notably adorned by them, may be very much distinguish'd, or (that I may use the Idiom of the Schools) diversified from the humane Soul.

The late followers of the Philosopher Epicurus have affirmed the Soul to be made of Atoms.

The first Assertor of the former Opinion was *Gomelius Pereira*, who affirmed that Beasts wanted all Knowledge or Perception; whom in our latter Age, the Famous Men *Cartesius* and *Digby*, with others Exactly followed; who endeavouring as much as they could, to discriminate the Souls of Beasts from the humane, affirmed them, to be not only Corporeal and Divisible, but also meerly passive; that is, that they were not all moved, unless that they were moved by other Bodies, striking some part of the Soul; from whence it followed, that every action of the Brute Consisted in it, as it were an artificial Motion of a Mechanical Engine, to wit, that first some sensible thing affecting the animal spirits, and Converting them inwards, stirs up sense; from which by and by, the same spirits being moved, as it were by a reflected undulation or wavering, return back again, and being determinated for the fitted order of the organs and parts of the Fabrick it self, in certain Nerves and Muscles, they perform the respective motions of the Members: For otherwise, if Cognition be granted to the Brutes, you must yield to them also Conscience, yea and deliberation and Election, and a Knowledge of universal things, and lastly an incorporeal and rational soul.

Others of them deny it to have Sense and Perception, as Gomelius Pereira.

Whilst these famous Philosophers suppose Brute Animals to be only certain Machines wonderful made by a Divine Workmanship; to wit, which without any Knowledge, Sense, or Appetite, perform only Corporeal Motions, and the Acts of their Faculties, according to the fitted structure of parts, and the precise direction of the spirits, within Certain measures or bounds of the Animals; yet some of them differ in their Opinions, about the structure and model of the Machine or moving Engine; to wit, for as much as the figure and properties of the Atoms, out of which the same is supposed to be made, are assigned one way by these, and after a divers way by those. The most illustrious *Cartesius*, unfolding all things by matter and motion, asserting the Souls of Brutes to consist altogether of round and highly moveable Atoms, which he Calls the Elements of the first Kind; affirms, That nothing else is requisite for all its acts to be performed, than that the fibres and nervous parts being struck by a stroke of a sensible thing, they receive a motion after this or that kind of manner, and transfer it by a Continued affection of the sensitive parts, as it were by a Certain undulation or wavering, into the respective parts: But our *Digby* supposing mobility of the particulars of this kind, out of which the Soul is made, adds further, That certain most thin Effluvia's, falling away from the sensible Body, do not only affect the Exterior sensories, but entring into the more interior recesses, mix themselves with the spirits, and moving them into Various fluctuations, do produce sense, and divers sorts of local motions: Moreover, that out of these Extrinsical Atoms, so entring into the nervous parts, and the Brain it self, do proceed not only Extempory Actions; but out of those left in the feeling body, and retaining the former Configurations, are Constituted the remaining Idea's, in the memory of things formerly done. It would be too prolix a business to recount particularly what appertains to the aforesaid Hypothesis, concerning the souls of Brutes, or animal Actions; or to Examine the Reasons of each; also to shew by what manner of Solutions of that Kind, those operations of the Brutes, which seem to be made by a Certain Judgment and Ratiocination, are wont to be unfoulded.

Cartesius.

Digby and Others.

But indeed these Solutions of difficult *Phænomena's*, and the Reasons for the mechanical provision of living Creatures, and their Souls, tho artificially formed by these Authors, seem not to satisfy a Mind desirous of Truth: And whilst every one expounds so the Works of the Creation, according to the model of his Wit, they seem to say, That God is not able to make any thing beyond what Man is able to Conceive or Imagine. Wherefore others, also renowned Philosophers, both Ancient and Modern, professing themselves no less adverse to Atheism than the former, Challenge in the behalf of the Beasts, not only the operations of an external and internal Sense, with Perception, Appetite, and spontaneous motions; but besides, grant to them a certain use of Judgment, Deliberation, and Ratiocination.

Others attribute to the Corporeal Souls sense and Perception; and further, the use of an inferior Reason; as

Nemesius an ancient Philosopher, discoursing of the Cognation or Propinquity of all Created things, after he had shewed from Minerals, that some things came near towards

Nemesius.

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the natures of Vegetables, and some of Plants, and Animals, *ἡ φύσις* (saith he) *μεταλαμβάνει*, &c. which is, The Common Architect passing from irrational Creatures to that rational Animal Man, hath not effected this suddenly, but first has referred certain natural Knowledges, and Artifices, and Subtilties to other Animals, so that they appear near to rational Creatures.

Phys. Sect. 3.
Memb. post
Lib. 8. Cap. 4.

Peter Gassendus, a most Skilful and Cause-Expressing Man, in his late Experimental Philosophy, when he had enumerated very many Instances, by which the Cunning and Wonderful Sagacity of brute Animals were declared; and also the Epithets, whereby these kind of Animals are noted by Philosophers, to wit, that some are called *Excelling in Knowledge*; others *Artificial*, these *Dexterous and Compleat*, or *Crafty and Wise*, at length the Author adds, that, *These things could not deservedly be attributed to them, unless they granted them a certain kind of Reason. However it be, we may seem at least to be able to distinguish, by a ready way, that as Commonly a two-fold Memory, To wit, a Sensitive and Intellectual, is distinguished, so nothing forbids to Call Reason Sensitive and Intellectual. And truly, as we understand by the Name of Reason, the faculty or beginning of Ratiocination, and that to Reason is nothing else, than to understand one thing by the Knowledge of another thing, there is nothing more Easily to be observed, than that Brutes do Collect one thing out of another, or what is the same thing, do reckon or recount, and therefore are indued with Reason.* From these we may easily understand, what dignity, and beyond the powers of any Machine, causing its Efficacy, he affirms to be in the Souls of Beasts. But in the mean time, if it be marqu'd, what Hypostasis, or formal Idea, he hath assigned them; it doth not so Easily appear, how that such Choyce Priviledges, do agree with those Souls, so slenderly gifted, as to their Substances. For when from the Opinion of Epicurus he had shewn these to be Corporeal, and their Bodies to be made up of most light and round Atoms, out of which sort fire and heat is Created; at length he Concludes; *The Soul therefore to be a Certain Flame, or a Species of most thin fire, which as long as it lives, or remains inkindled, so long the Animal lives; when it no longer lives or is Extinguished, the Animal dyes.* But indeed, concerning his Hypothesis, he ought to have unfolded, by what means this Fire *Intelligent and Artificial* (to speak like the *Stoicks*) could be; or how a flame within certain bounds and Organs of the Body, however framed with the most excellent artifice, being inkindled and dilated, can be able to produce the Acts of the animal Faculty; This I say, most difficult Problem, this most Learned Man came to, and pass'd over its Knot as it were purposely in that place.

Who asserts the
Soul, to be a
little flame, or
a Certain fire.

CHAP. II.

The Opinion of the Author Concerning the Soul in General,

That the Soul of the Brute is Corporeal and Fiery.

Why the Soul
of the Beast
seems not to be
an incorporeal,
and immortal
substance.

After having thus recited the chief Opinions of others, It now remains that we propose our own Opinion, or rather Conjecture, in so hard a matter. Where in the first place, I am not easily led to believe, That the Soul of the Beast is an Incorporeal Substance, or Form: For as to what relates to that *Platonick Fiction*, concerning the Soul of the World, that, and also the Heresie of the *Manichees*, hath already been refuted and clearly exploded, both by the Ancient and Modern both Philosophers and Theologists, that there remains no further dispute about it. Further, neither can I Consent to those *Origenists*, who have affirmed the Souls of all Living Creatures to be immaterial, and also to subsist before and after their Bodies. For, tho I should be little solicitous, for the almost infinite multitude of the more perfect Beasts, which have liv'd, and do live, yet where do so many Myriads of Souls, even innumerable, of Insects and Fishes, which are dayly produced, subsist, and what do they? The Bodies of very many of these serve only for Food to other Creatures. And for that the Souls to these Bodies, serve chiefly to preserve them only for a little time, and as it were pickle them to keep them from putrefaction, there is no need that these should be therefore immaterial and immortal. Besides, when of old, *Egypt* was infested by Divine Punishment, with Swarms of Fleas, Flies, and other Various Kinds of innumerable Insects, and that the same also abounded every where, it is not easily to be Conceived, from whence so many Souls were so suddenly Called, and into what places, the same being by and by separated, could be placed. Moreover, as Heaven, the Kingly Palace of the Great God, challenges for it self Angels, *Gen. 2.* and pure Souls, free from all spot, to be its Inhabitants: but

but the Earth, as it were a Certain sink, draws forth and extracts the feces of things, and from its bulk, ruinous Bodies; it seems more agreeable to the fitted Oeconomie of the World, that all immaterial things (with the humane Soul, which we have noted to be placed in the Confines of Nature, that it might be the fastning and knitting of either System) should be ascribed to the Air; but the other Animals, Condemned to the belly, and prone to the Earth, to this Glebe; so that the Souls of those, may be said to be born and dye with their Bodies, and to be altogether Corporeal. Yea if that Reasons and Arguments of greater weight, fight for this Opinion, than those we have seen on the opposite side; wherefore should we not rather follow this, and pass farther on into its parts?

And indeed, that the Soul of the Brute, even as the inferior of Man, Is material and divisible, yea Co-extended with the whole Body, seems to appear from many things; both first, because we perceive many and divers animal Acts, to arise at once, from divers members and parts of the Body: For Examples sake; in the same instant, that the Eye sees, the Ear hears, the Nose smells, the Tongue tastes, and all the Exterior members Exercise the sense of feeling and motion, and in the mean time, all the Inwards and the *Præcordia* perform their offices. Wherefore, since there is no medium between the Body and the Soul, but that the members and parts of the Body, are the Organs of the Soul; what can we think else, or affirm, but that many and distinct portions of the same Extended Soul, actuate the several members, and parts of this Body? Besides, it is seen in several living Creatures, whose Liquors, both the Vital and Animal (in which the Soul as to all its parts immediately subsists) are viscous, and less dissipable, that the Soul is also divided with the Body, and exercises its Faculties, to wit, of Motion and Sense, in every one of the divided members, layd apart by themselves. So Worms, Eeles, and Vipers, being cut into pieces, move themselves for a time, and being pricked will wrinkle up themselves together.

It is shown that it is Material and Co-extended with the Body.

But that we have affirmed the Soul of the Brute to be not only Corporeal, and Extended, but that it is of a certain fiery nature, and its Act or Substance is either a Flame or a Breath, near to, or a-Kin to Flame, besides the large Testimonies of Authors, both Ancient and Modern, Reasons and Arguments almost demonstrative, have also induced me to it. Some of the Chief of these, we have of late Exposed in the Treatise concerning the Inkindling of the Blood; there remains many others of no light moment to be added hereafter. As to what appertains to the suffrages of others, that I may not seem to stand upon the Authority of one *Gassendus*, who has maintained this Hypothesis; I shall here Cite many both Ancient Physicians and Philosophers. For not to mention *Democritus*, *Epicurus*, *Laertius*, *Lucretius*, and their followers; *Hippocrates*, *Plato*, *Pythagoras*, *Aristotle*, *Galen*, with many others, tho disagreeing about other things, in this Opinion, to wit, That the Soul was either a Fire, or something analogical to it, they all hook hands; to whom also have joyned themselves of the Moderns, *Fernelius*, *Hennius*, *Cartesius*, *Hogelandus*, and others: and lately *Honoratus Faber*, hath delivered in Express words, *That the Soul of the Brute is Corporeal, and its Substance Fire is self*: But indeed he far otherwayes Explicates his saying, than is propounded in our Hypothesis. For having shewn this Soul to be material, and supposed all sublunary matter to be nothing else but the four Elements, he therefore Concludes the Soul of the Brute, because it is not seen to be any thing Compounded out of the rest of the simple Elements, or of many of them, *That it is mere Fire*, *Traët. 2. l. 2. pg. 33. ad 38.* I shall take notice of one or two of our Countrymen. The most noble *Verulam*, chiefly distinguishes animals from inanimals, in this respect, for that the spirits of those are otherways inflamed and inkindled, than the spirits of these. *Natur. Histor. Cent. 7.* The most Learned and Famous Physician *George Ent*, in his Apology against *Parissanus*, That Blood even as Fire, desires two things, to wit, Food and Ventilation, hath most clearly demonstrated. Wherefore, after so many Learned Men, it will be no Paradox to affirm, *That the Soul lying hid in the Blood, or Vital Liquor, is a certain fire or flame*; which Opinion agrees well enough with right Reason, as appears by what follows.

The Suffrages and Reasons of very many Authors, perswade that the Soul of the Brute, is not only Corporeal, but Fiery.

The more Ancient Philosophers and Physicians have so affirmed.

Also many Moderns of great Note. Hon. Faber. Traët. de Plantis et gener. anim. &c.

Arguments and Reasons perswade the same thing.

Indeed if Fire and Flame are to be defined or unfoulded, not by those External accidents of burning, glowing, and of heat, (which are not its proper Passions) but by intrinsic Causes; we conceive very easily, the substances of them to be even as the Souls of the Brutes, or altogether of the same sort. For truly, Fire, if we would describe it according to its Essence, it signifies an heap of most subtil Contiguous particles, and existing in a swift motion, and with a continued generation of some, renewed by the falling off of others; which indeed Conserves both its motion and substance; for that its Food, on which it continually feeds, is perpetually supply'd from the subject matter, which is Sulphur or some other nitrous thing in the Air, that Compasses it about; for from thence, out of the Food of either, the Particles being most minutely resolved, and agitated

The definition of Fire and Flame by its Causes and Essences, agrees also with the Soul of the Brute.

tated with a most rapid motion, the forms of Fire and Flame (which differ only in more or less) result. Since we have in another place discoursed largely enough of these things, it will not be needful to add any more here.

The Souls of all Brutes after the manner of Fire, want a two-fold Food, to wit, a Sulphureous and Nitrous.

What if we should in like manner say, That the Souls of Brutes, are an heap of these sorts of most subtle Atoms, heaped up together, and extremely moveable? To wit, which being stirred up with Life into motion, as it were an infiring, Continue the same, and likewise its subsistence, so long as Nutriment, out of the apposite matter, which is by degrees Consumed, within Sulphureous, and without Nitrous, from the ambient medium, is granted to it. For that we say, That the Souls of all Brutes, so long as they live, and flourish after the manner of fire, do want Constantly either kind of aliment; to wit, Sulphureous and Nitrous: That this is true, is shewed hereafter, as well concerning Insects and other bloodless Creatures; also concerning Fishes, and the more frigid bloody Creatures, as well as in the more hot and perfect Creatures, that have blood: Which Conditions however, are required to the Act and Subsistence of no subject besides. But no motion, either of Fermentation, Ebullition, Vegetation, or of any other thing, (besides Life and Fire) is immediately suppressed, by reason of the taking away of the Air.

There are three things to be Consider'd of Concerning the Soul of the Brute. Its Subsistence or Hypostasis.

Concerning the Corporeal Soul in general, these Three things first fall under our Consideration: viz. First, What kind of Subsistence or Hypostasis it is of. Secondly, In what its Life or Act consists: And Thirdly, What are its primary Offices or Operations.

As to the first, we may believe, That the Brutal Soul doth consist of Particles of the same matter, out of which the organical Body is formed, but that they are choyce, most subtle, and highly active, which, as a flower arising out of the grosser mass, do mutually come together, and do constitute fit passages, which they produce throw the whole frame of the Body, having got one continued Hypostasis, to wit, very thin, and as it were Spirituous, and equal, and extended to the whole. For indeed, so soon as any matter is disposed towards Animation, by the Law of Creation (and not by a Fortuitous Concourse of Atoms) at once, the Soul, which is the form of the thing, and the Body, which is called Matter, begin to be formed under a certain Species or Kind, according to the Model or Form impressed upon them. Wherefore, the more nimble and Spirituous Particles, rowling away from the rest, heap themselves together, and by leasure grow Turgid. These being thus moved, stir up others more thick, and dispose them into destinated places, where they ought to stay and to increase, and so they frame the Body, according to its destinated Species. In the mean time, this heap of subtle Particles, or the Soul, which explicating it self more largely, and insinuating its Particles into other more thick, and weaving them together, frames the Body, and is exactly formed according to the dimension and figure of that Body, is Co-extended with it, and fitted exactly, as to a little Box or Sheath, actuates, inlivens, and inspires the whole, and all its parts: Further, on the other side, the same Soul, being apt presently to be dissolved from it self, and to vanish away into Air, is Conserved by the Containing Body in its Subsistence and Act.

So indeed, the Soul, altho most thin, yet Corporeal, seems to be as it were the Specter, or the shadowy hag of the Body: Further, this arising together with the Body, out of matter rightly disposed, receives its Hypostasis or Subsistence, no less than the Body, according to the Idea or Pattern fore-ordained to it, by the Law of Nature; But altho intimately united to the Body, and is as its prop or stay, Yet being made of a most subtil texture, and as it were of a most slender thrid, it cannot be perceived by our Senses, but is only known by its Effects, and Operations. Moreover, when as by reason of hurt hapning to it, or to the Body, that the Life of the Soul perishes or is destroy'd, presently its Particles being snatched away from the Concretion, or its mutual adhesion, they are altogether dissipated, without any footsteps or marks left: In the mean time, the Body being made exanimat or Soul-less, by and by tends to Corruption, but indeed, if it be more gross and more Compact, its Principles waisting or unrolling themselves leisurely and by degrees, it is not Corrupted but of a long time.

In its Life or Act.

2. The Existency of the Corporeal Soul, depends altogether on its Act or Life; and in this respect it seems most like to Common Flame, and only like it; to wit, for as much as the substance of either, as soon as it Ceaseth from all motion, it is no more, and can by no means be made whole again in the same number. Wherefore, the Essence of this begins altogether from Life, as it were the infiring of a Certain subtil matter; to wit, when many active, and chiefly spirituous, and sulphureous Particles, with some other saline, being predisposed to Animality or Life, come together, in a fit Furnace or fire-place, take Life, sometimes being as it were inkindled by another Soul, sometimes of their own accord, which, from thence being supplied, constantly (as we have said) by a sulphu-

sulphureous food within, and a nitrous without, Endures for some time; until at length, by the defect of Either of these, or by reason of some Violence or Injury hapning outwardly, the same as it were being Extinct, perisheth quite. The Act of the Corporeal Soul, or the inkindling of the Vital matter, in the more perfect Brutes, being indued with an hot Blood, appears so clearly and openly by noted heat, by the Exhalation of its fumes or sut, with other Accidents and Effects proper to the Kitching flame, that any one Considering or weighing them, may well believe that the blood doth truly flame forth, and that Life is not so like to flame, but even a flame it self, as we have formerly shew'd at large: But indeed in others less perfect or frigid Animals, altho we do not say the Soul is properly flame; yet (which is next to it) we say it is a most thin heap of subtil Particles, and as it were fiery, to wit, a certain spirituous breath; this being shut up in the Body, agitates its thick bulk, actuates all its members, and arteries, and in some with wonderful agility, goes thorow and inspires the same, more than in the more perfect animates, as appears in some Reptils and Insects. Further, that there is a firey Vigor in these Kind of Souls, may be even Collected from hence, because, whilst they live and do not lye asleep, they have no less need of Food and access of Air, than the more hot living Creatures; as shall be declared anon.

3. As to the Operations in General of the Corporeal Soul, we say, That as soon as it Exists in Act, that it performs chiefly these two offices; viz. First, to frame the Body as it were its domicil or little house, and then that Body being wholly made, to render it apt and fitted to all the Uses necessary both to the Kind, and to the Individuum: for which Uses it is furnished with a manifold Guard or Company of Faculties or Powers; also according to the Various instincts and suggestions of Nature, it exerts or puts forth as it were predestinatedly the Acts of a Various Kind, altho almost after the same manner. It will not be an easy matter here to rehearse, all the natural Powers and Habits with which all Corporeal Souls are wont to be gifted, to wit, because they are not in all after the same manner; But as living Creatures are more or less perfect, some than others, also according as they being destinated for the Various Scene of this worldly Theatre are diversly figured, and ought to live, their Souls also are furnished by a divers manner of provision of Faculties: The speculation of these things, tho very pleasant and profitable, is too copious and large for us to divert our selves within this place; But for the illustrating of our Psychologie or Doctrine of the Soul, it may not be amiss to recite the chief Kinds of Living Creatures, and to reduce them as it were into certain Classes or Forms, and then to describe their Chief Species, together with the Various degrees of the Souls, that inhabit them.

In its Offices and Operations.

CHAP. III.

The Various Kinds of Brutes, together with their respective Souls, and the chief Species of each of them, are rehearsed and described.

For as much as the Brutal Soul ought to be proportionate to the Organical Body, it easily follows, that as there are Various kinds of Bodies, in the divers Habitacles of this world, and offices of those Bodies destinated to life, so also Various Souls, by which they are actuated, do exist, and are indued with a Divers Gift of Faculties. If we would consider the perfect Sence of these, it were first needful to write the History of all Animals, and to deliver the Anatomy of each of them. But as that will be a business of an immense and tedious labour, it seems much more to the purpose, to reduce here, all the Brutes to certain Kinds, according to some certain affections in many of them, and thence to describe some chief Species of those Kinds, and their Various Compositions and Structures, in respect of the Vital parts.

Living Creatures may be distinguished or reduced into certain Classes, either First, according to their Various Organs of Respiration, which in some are numerous Branchiæ or Gills, and these dispersed thorow the whole Body, as in many Insects, or they are appropriated Branchiæ or Gills, in Fishes; or lastly, Lungs, common besides to divers animals, with Man. Or secondly, the rehearsal of the Brutes may be made according to the Various Constitution of the vital Humour, in which respect, they are either First, without Blood, or Secondly, of a less perfect or frigid Blood, or Thirdly, of a more perfect or hot Blood: And to this partition, as the more Known, insisting here, we shall run thorow the several members of it in Order, and briefly Notifie in them the Fabricks of the Blood.

Animals are reduced into Classes either according to the Organs of Respiration, Or according to the Vital Humour; and they are either without Blood, or of frigid Blood, or hot Blood.

the chief Vital parts of the Body, and the Constitutions of the Souls, Inhabiting them.

Bloodless Creatures are either of the Earth or Water.

First, Bloodless Creatures, are either belonging to the Earth, in which number are very many Insects; or belonging to the water, of which Kind, besides some certain Kinds of Insects, are also found various Fishes, which are wont to be divided into Soft, of which sort are the Cuttle Fish, the Sea Woolf, &c. Shelly, as Oysters and Cockles, &c. And Pargated or other thinner shell'd Creatures, as the Lobster and Crab: We will examine in either sort, some chief Species of these Bloodless Creatures, as to the States of their vital Parts, and their Souls.

It appears that Insects have fiery Souls, because they want Sulphurous and Nitrous food.

First, Therefore in earthly Insects, altho indued with a small bulk that they have great Souls, their Actions testify, which indeed are performed by some of them, as the Silk-worm, the Bee, the Ant, or Emmet, the Spider, to admiration: Further, That the Souls of these are of a certain fiery nature, no less than those of the more hot and perfect Brutes; we from hence deservedly suspect; because they stand in need of a Copious Food, after the manner of an inkindled Flame, and of the access of much Air. The first appears by common Observation, for as much as Insects often devour all the Corn, and Leaves of Plants, and so take away the grateful greenness of the Summer. Besides, it appears from hence, that their Lives require a constant afflux of Air, because as it hath been experienced by our noble Mr. Boyle, Insects being put into a glassy Globe, quickly dye, after the Air is sucked out. This the Learned Malpighius hath more fully declared in his most ingenious Tract of the Silk-Worm: where he Observes, *That Insects have not only Lungs, but so abound in them, that every little ring or section of them is indued with two, yea and that every part also of the Viscera or Inwards, delight in the derived Lungs.* For as in the sides of Insects, the whole length of the Body on both sides, black spots or pricks appear, he hath found, that these were indeed tunnels or breathing holes, leading from so many Wind-pipes or asper Arteries, which by and by, being branched forth into the Heart, Ventricle, Spinal Marrow, and all the other Inwards, and Internal parts, carry in and out air to and from them all. Moreover, if these orifices be all smeared over with Oyl, or Hony, the Worm presently dyes; but if only a part of those breathing holes be so stopped, the neighbouring parts being by and by Convulsed, and then resolv'd or loosened, sink down or flag, the rest keeping their motion: But if the orifices of the Trachea or Wind-pipe be untouched, and that the Head, Mouth, Belly, or any other parts be sprinkled with Oyl, neither death nor any trouble of the Sense will be induced; and what is yet more wonderful, the Insects that have oyl or the like poured into their Wind-pipes, so suddenly dye, that tho the Heart keep a motion for some space, yet they can never be revived. These Phenomena happen alike not only in the Silk-Worm, but in Wasps, Bees, Grass-hoppers, Locusts, Caterpillars, and other the like Insects, which certainly, I believe, gives very much Light concerning the use of Lungs, in every Animal: But first let us inspect some other Parts of Insects, described by a most accurate Anatomy.

These have Lungs, or numerous wind-pipes, the Orifices of which, if stopped up by Oyl, presently death follows.

The Heart of the Silk-Worm is long, unequal and stretch'd forth thorow the whole Body.

Therefore he says in the Silk-Worm, and the like in others, That the heart is placed all along the Back, between the Muscles and the Lungs, here and there appending, and that it is stretched forth from the top of the Head to the extreme part of the Body; This consisting of their Membranes, as appears as it were one Tube or Pipe, but unequal, to wit, sometimes broader sometimes narrower, continuing from the Tail to the Head, so that for their inequalities, they seem as so many Eggs, or little Hearts, one laid by another, and continued by one passage. These little Hearts, or the aforesaid parts of the Heart, do gently drive forward, not at once but successively and slowly (after the manner of their membranes) being bound and dilated from heart to heart sometimes upward, sometimes downward, the contained vital humour, which is limpid or clear, and so (as we may believe) a certain portion of the vital humour, being squeezed forth into the Arteries (which are so small and few, that they cannot be seen) is agitated by the Circulation of the rest, contained almost only within the oblong Cavity of the Heart.

The Brain is wanting, the Spinal Marrow being sufficiently large.

As to the head, this most diligent searcher observed, that Insects had no Brain within the Skull, its Cavity being filled with the Muscles of the Eyes, and some others, but its Spinal Marrow sufficiently large, and divaricated in many places, for the going out of the Nerves, and as it were protuberated with knots, is extended from the Head to the Tail; and what is worthy to be noted, in the whole passage, branches of the Trachæa or Lungs were superinduced to this spinal Rope, and inserted to it in very many places. I omit what he most learnedly discourses of the members, ventricle, and other Inwards of Insects, lest it should seem impertinent, or too much Plagiarism: But that the discourses may be the better understood, concerning the vital parts of Insects, it will be convenient here to borrow the draughts of the heart of the Silk-Worm; and of the Trachæa or Wind-Pipes, both of that and of the Grass-hopper, and Locust (in which the Trachæa

chæa or Wind-pipes are like to other Insects) most diligently delineated by *Malpigi* ; which shall be added at the end of this Chapter, with other Figures of other Animals ; but these the first Table shews. Further, as to what belongs to the Doctrine of the Soul, we may with the Authors lieve Philosophize, or at least conjecture, concerning the Phenomena of the Heart and Lungs by him described.

Therefore, for that Insects first having such copious Lungs dispersed thorow all the Viscera or Inwards, Heart, and spinal Marrow, to which that each might come distinctly, they have many distinct Trachæas or Wind-pipes, with so many gaping orifices, on the superficies of the Body, it appears from hence, that the use of the Lungs in these little Animals, is not for the refrigeration of the Blood, or its exact mistion, nor for the suscitating the motion of the Heart ; because, neither the Vessels carrying the Blood or Vital Humour, accompany the Trachæa or Wind-Pipes, nor is such a humour to be rapidly Circulated, but seems to be only carryed and placed gently into all the parts.

The Use of the Parts is exposed.

But that the orifices of the Wind-pipes being stopped, presently Life is extinguished in these (as also in a glassy Globe empty of Air) what can one imagine else, but that this access of Air, is required for the sustaining of the Vital Flame, as it is wont to be for that of the Chimney ? Wherefore, because the vital humour (which is not at all or only slowly Circulated) cannot be carried all quickly to one Fire-place of accension, as in more perfect Creatures, therefore very many Lungs gaping every where outwardly, and dispersed every where inwardly, are framed for the bringing of Air to the several portions of the vital humour, planted on all sides ; for that not only the Heart, but also the Ventricle, Genitals, spinal marrow, and all the other parts of the Soul dispersed, growing with a kind of silent Fire, are inspired with the admitted Air, to every one a part.

Why such numerous Wind-pipes.

Besides, when as the vital humour cannot be Circulated into all the other parts, and from these into that, with a rapid motion therefore, instead of a Conick Muscle, which receiving the watering juyce, may be able to explode it presently, and to cast it forth a great way on every side, a Tube or as it were a membranaceous Sack or Bag is made, to wit, which by a long tract stretching it self nigh to all the parts, and to which it might by degrees bestow what might suffice, and in the mean time gently moving the provision chiefly contained in it self, preserves from stagnation or putrefaction. Further, the little Branches of the Trachæa, deeply inserted into the Membranes or Coats of this, inspire or rather inkindle the humour contained with vitality.

Wherefore the Heart is so long.

As to the aquatick bloodless Creatures of the other kind, viz. some soft Fishes, also many, perhaps all shelly and crusty Fishes ; I have not yet happened to see the former, but *Severinus* being my Author, the *Sepia* or Cuttle Fish is made with an heart and gills, and the *Polypus* or many feet with it and Lungs : what is to be met with that is more curious in the framing of them shall be omitted. Concerning the other two Fishes, to wit, the shelly and crusty, we shall add some Anatomical Observations, such as we have search'd out in their vital parts, and other beginnings, truly weighed, and what the souls are of these sort of bloodless Creatures.

Bloodless Creatures belonging to the Water.

Soft Fishes.

Of the testaceous or shelly, though it hath been dissected by many, we shall make choice of the Oyster. The body of this Fish, though it seems rude and wholly without shape, yet it hath all its Viscera and parts, and especially the Præcordia, for, as it were the hearth and Tunnel of the Vital Fire, most curiously framed. As we shall describe some of the chief of these, we will begin with the shells, which are born with them, from Eggs, and are first soft, and as they encrease in bulk they are by degrees hardned : A robust Muscle being implanted in the middle of the Oyster, grows by its tendons to either shell. The moving Fibres of these (which seem as it were a little bundle of Chords or Strings) ascending rightly, whil'st they are drawn together, strictly shut up the shells ; but being relaxed, they suffer them to be opened and lifted up ; to which Office of opening the shells, another Muscle adjoyned to this, is required. Besides these upright Muscles, and perpendicular to the planes of the shells, there are two Circular, stretched forth by the brims of either shell ; which in the same place comprehending in themselves Gills, serve chiefly for their motion ; as we shall shew by and by.

The Anatomy of the Oyster.

The Muscles opening and shutting the shells.

On the top of the Oyster, the Circular Muscles being united, make a thing as it were a Vail for the covering of the head ; then being a little divided below, they include four superiour Gills : In the middle of which, a gaping chink leads by an oblique process to the mouth of the Oyster. From the Mouth there is a short and strait passage to the Ventricle. The Cavity of this large enough, is endued with little holes, leading into darkish bodies, fixed on either side of it. These bodies seem to be in the stead of the Mesentery and Liver, and to perform their offices ; to wit, for that they receive

Circular Muscles moving the Gills.

The Mouth of the Oyster.

The Ventricle of the Oyster.

The Liver and the Mesentery.

the more pure part of the Chyle, by and by from the Ventricle, and deliver it, being made clear from dreggs, to the vital humour. The like is in crustaceous Fishes, and perhaps in some Brutes; to wit, in such as a simple and only Intestine, without folds and Meferaick or milky Vessels, is produced from the *Pylorus* to the great Gut or Ars-hole.

The Intestine.

For so in the Oyster, the Intestine beginning from the bottom of the Ventricle, descends with a plain and equal Tube, towards the right Angle of the streight Muscle, where being rolled and retorted in it self, it ascends again towards the Ventricle and Liver; being from thence demersed, and bending back towards the left side, goes towards the border of the strait Muscle, till it ends in the great Gut or Ars-hole: After this manner in the Oyster, a simple and only Intestine is carryed about, with a most long compass, more than in many other Animals, by which indeed they may be able the longer to retain their Dung; to wit, lest that when they are dry, that being more importunately put forth should polute (by mixing with it) the water, for the food of life, included in the shell.

An Intestine in an Intestine. Which perhaps is the Spinal Marrow.

This Intestine being dissected and opened longways, in the bottom of it arises an hardish and almost round body, which ascending from the Arse to the Ventricle arises there, and stretches under the *Oesophagus* towards the Head: The like to this is found in a Worm, which hollowness in it we think to be in the place of the Mesentery and milky Vessels: but otherwise in the Oyster, this hard and compacted body being less apt for such an office, seems not unlike to the spinal Marrow: But we shall shew the Chyliferous passages do supply the darkish bodies, hanging to the Ventricle.

As Pericardium with the Heart and Vessels.

Below the Ventricle, the *Pericardium* is placed, including the Heart, being whitish with a large black ear, which being opened, that is beheld to beat, and at every *Diastole* to admit the vital humour, out of the hollow vein, into the little ear; then at every *Systole*, to drive the same forward into the *Aorta*, placed on the contrary side; then by tripartite branches of this Vessel, a certain part of this humour tends upwards, towards the Head, Liver and Stomach; also a certain portion is reflected into the strait Muscle; in the mean time a great part of it being delated from the great Trunk of the Artery, to the *Branchia* or Gills, it is there unfolded, within most small and numerous passages, as it were little Rivers, that it might enjoy, according to all its parts, little nitrous bodies inspired from the water. And that this may be the more plentifully done, we observe that the water, as in bloody Fishes, did not only wash the outward superficies of the Gills; but that it every where did enter all the more intimate recesses, and deeper passages; yea these Gills expanded largely thorow the Hemisphere of the Oyster, exceed in bulk, all the other Viscera, also almost the parts. So that in Fishes, because they breath but little in the water, it is so provided that in many places together, the food of respiration should be afforded them.

The Gills.

The Description and use of them.

There are Four hairy tufts of Gills, and as it were two Lobes of either of them; to wit, the upper more broad and thicker, and the lower which is thinner and a little more contracted; in all the passages of them, every one is two-fold, and contains two series of little Finns, seen to grow together; to the several Gills belong two Vessels, the Artery and the vein; which being deposited in the heaps of the hairy tufts, dispose the small shoots of either kind thorow all the borders. But besides these Four orders of Vessels, there are found also so many series of little breathing holes, lying between these Vessels; which also by manifest passages open in the places between the Finns: and from thence they deduce the waters sup'd up by the inferiour mixture or joyning of the Circular Muscles: The like is in crustaceous Fishes, as we shall shew by and by.

The motion of the Gills depends upon the Circular Muscles.

As to the motion of the Gills, it is clear by ocular Inspection, that the Circular Muscles, which are knit to either shell, for the shutting them, when relaxed, do reach to the extream brims of the shells; whereby at that instant, also the Gills being relaxed, they imbibe the Waters, and together from them draw the nitrous food; and by and by being contracted, they are drawn inwardly, and together compel the Gills, to the pressing forth the Waters newly admitted.

Shelly and crustaceous Fishes, contain waters in their whole bodies, to wit, whereby they may be able to live out of the Waters.

If the Reason is asked, why shelly Fishes (which also holds with the crustaceous, as we shall shew anon) have besides the Vessels carrying about the vital humour, also Passages or open Channells, by which the Waters are carried to their most intimate recesses; it seems to be because both these sorts of Animals, though they reside at the bottom of the Sea, yet oftentimes they happen to remain dry, therefore that they might then breath (the most wise Creator so providing) they contain plenty of water within their own frame, as it were reposed in Wombs; by the during provision of which,

which, they live as well in the open Air, as in the Waters; But these Waters being taken away, shed, or evaporated by heat, both these sort of Fishes quickly dye: By reason of these Waters, these live longer then others out of the Waters. Further, as the Noble Mr. Boyle hath observ'd, the Oyster and the Sea-Crab, being put into a Glassy Globe, after the Air was suck't forth, did not presently expire like many other Animals; to wit, because part of the Intestine Water being rarified, quickly supplied the defect of the exhausted Air; at least, that being detained within the proper frame of the Fish, affords an inkindling or matter for respiration. It is sufficiently known, that the Oyster, when it is taken out of the Waters, hath a great quantity of Waters shut up within its shells: as also the Lobster (which we intend to consider of among the crusty Fishes) doth the same thing, as shall be declared. In the mean time, for the illustration of this our Anatomy of the Oyster, *Tab. 2d*, shews the Figures of its parts aptly represented.

The Lobster and other Fishes a-Kin to it, viz. the Crab, Sea Creevish, Shrimps, &c. As they retrograde, or rather swimming backwards, so their parts and Viscera in respect of other Animals, seem to be inverse or opposite: For as to the members and moving parts, the bones are not covered with flesh, but the flesh with bones: wherefore, almost all the Muscles of the Feet, Arms, Head, Back, Tail, and other parts, either moveable or moving (excepting those that are temporal) are shut up every where with a crusty covering: Indeed it is so ordained by Divine Providence, that as these Animals inhabit among Rocks and sharp Stones, lest they should be in danger of being dashed too hard by the force of the Tides, they are fortified with Bones, planted outwardly, as it were with Armour: Moreover, lest that the crusty Covering should more sharply compress the Membranes, or the Flesh underneath, or should rub against them, the same is every where covered within with a thick Purple Muck or Stuff, as it were lined with a soft cloath: I do believe this purpuling in crusty Fishes, otherwise than in soft (who also are besmeared with muck) to happen through the greater plenty of Sulphur.

The parts and Viscera of Fishes swimming backwards are inversed.

As their Bones and Flesh, so their *Præcordia* and *Viscera*, are observed to be *Histeron Proteron*, topsie turvie; for the Liver, Stomach, and Womb is placed above, and the Heart below, yea contiguous to the Back: yea, and the spinal Marrow lyes not close to the Back, and above the Viscera, but under them, and to the prone part of the Body, in its whole passage; and is included in the bones or jointings of the Sternum, or meeting of the Breast.

But that the Parts and Viscera of the Lobster may the better be beheld, let the armed coat with the red Muck and Membrane lying under it, be taken away; then in the top of the head, appears the Brain but meanly large, of a greenish colour, and as it were two-fold; from which the mammillary Processes, and the Optick Nerves ascend, and two shanks of the oblong Marrow descend into the spinal Marrow, and in its whole process, they are sometimes divided, and sometimes placed together, now united, and then again seperated one from another.

The Brain of the Lobster.

The Nerves and spinal Marrow.

The *Oesophagus* tends from a two-fold mouth, by a strait and short passage, into the Ventricle, this large indued with a thick and strong Membrane, has three Teeth within its Cavity, by which its aliments are chewed or bruised: further, for the work of Chawing and bruising, two pair of muscles are framed, in the neighbouring parts, to wit, one temporal or belonging to the Temples, and another hanging to the sides of the Stomach; from the sides of the Stomach or Ventricle, grow too glandulous Bodies, stuffed with many Vessels and various passages, as it were certain little thin Intestines, and from thence being by degrees sharpened with two Lobes, they descend into the lowest Trunk of the Body; from the Stomach into these Bodies, on either side, passages lye open, so that wind being blown into it by a Pipe, presently it runs into these and makes them swell up: These parts in crusty Fishes (as also in the shelly) are commonly called the Liver, and indeed they seem to perform the Offices both of the Liver and Messentery; to wit, for as much as they receive the more pure portion of the Chyle fresh digested in the Ventricle, and commit that by and by, being made purer, to the vital humour. *Malpigi* observes in the Silk-Worm, and in other Insects, that certain diversified Vessels, analogical to these Bodies, are stretch'd out through the back of the Ventricle, and from thence to reach lower upon the Intestine; which (as he probably thinks) receive the more thin portion of the meat already macerated and loosned in the Ventricle; and deliver it, the juyces perhaps being not much changed, to the Heart, or at least to the Skin and other parts of the Body. Truly by observation, after what manner these parts which supply the place of the Liver and Messentery, in some Fishes and Insects are made; something may be thence gathered concerning the uses of the Liver, and of the Vessels both *Miscraick* and Milky, in bloody Brutes.

The Oesophagus.

The Ventricle from which there is a passage into the Liver and Messentery.

De Bombic. p. 40.

Things answerable to the Liver and Messentery in Insects.

- Spermatick Bodies.** In the Male Lobster, above the beginnings of the aforesaid parts, on either side, from the sides of the *Oesophagus*, the spermatick Bodies begin, which being sent down towards the bottom of the Trunk, and there being more compacted and made smoother, after the likeness of the *Epididimis* or thin covering of the Testicles, are terminated in two Yards; the Tops of which have their going out thorow holes forged in the last little feet but one. In like manner in the Female Lobster, two nests of Eggs on either side of the sides of the *Oesophagus* and Ventricle are placed, and pass into two Wombs planted in the lowest Trunk of the Body, and into those, thorow the holes forged in the last little Feet but one, there lyes a passage to the genital Members, also a passage from the Womb for the laying of Eggs: so that it appears how these living Creatures are most fruitful, with a multiplyed Issue, when as nature seems to be careful and industrious about their genital parts, being double and greater than in many other Brutes; to wit, that as they being both at once double, they might produce both by the works of Generation, Conception, and bringing forth not only always Twynns, but almost *Miriads* of Twynns.
- Two Yards in the Male.**
- Two Wombs in the Female.**
- The Pericardium and Heart.** Below the Ventricle, yea and lower also then the beginnings of the other Viscera, the *Pericardium*, in which the beating heart is included, is placed in the bottom of the Back; the *Systole* and *Diastole* of the heart are strong and swift, as in Creatures of Blood; this appearing of a whitish Colour, is indeed a *Conick* Muscle, whose Cavity being sufficiently large is framed with Fibres or Columns, also with many strong and various little Furrows: The *Aorta* going forth from its top, is cleft presently into two Branches, which go towards the Gills; The *vena cava*, one ascending, the other descending, meet together from the bottom of the Heart, and there enter into its little ear. The Heart whilst it is relaxed, receives the vital humour from the vein, and by and by when it is contracted, drives it forward into the *Aorta*.
- The Aorta.**
- The Gills.** The crusty Fishes, even as the shelly altho without Blood, are indued with numerous and large Gills, which are instead of Lungs; to which, that all the Vital humour may be frequently carried, therefore not as in earthy Insects, are they dispersed thorow the whole Body, but on either side, under the brim of the armed coat, and being gathered together in one place, are made into certain little bundles: The inferiour and utmost part of the Gills, which are broad and obtuse, is fixed to the *Sternum* or meeting of the Breast, with hanging little feet; the upper part ascending under the Coat is loose and free, and by degrees grows sharp; otherwise than in Fishes with Blood, whose Gills are tyed together, being solid at either end.
- The Gills of the Lobster have three Bosoms.** In all the Gills of the Lobster, Three Bosoms are found, of which two seem to be made for the carrying in and out of the vital humour; because a black Liquor being injected into the heart, passes to the Gills, and there passing first thorow one Bosom, returns by and by thorow the other. We will speak by and by of the third: from these Bosoms appear productions of small Vessels, as if it were feathery, arising on every side, thick set and short, like jagged welts or fringes; which being spongy, sup up the Waters continually flowing to them, at every turn of the *Diastole*, and press them forth by *Systole*: to wit, for the end, that whilst it is there unfolded within the small passages, the food for the vital humour may be inspired. The Third Bosom being carried from the top of every Gill, to its Basis ends in the common Channel, in all the Gills of the same side, which nigh to the insertion of the highest Gill (which beats perpetually) gapes with a large gap; Any one may easily perceive this, in a live Lobster, whilst it breathes out of the water; for in every *Systole* or pulse of this supream Gill, one may see a bubble of water break forth out of that hole. Further, if into that hole a black Liquor be injected, by and by entring under that Common passage, it passes thorow from thence, both into all the Gills, and the small and feathery Bosoms of them, and also into the Arms, and all the little feet (the Cavities of which the Muscles do not fully stuff) yea, and into the Cavity of the Body. In like manner wind being blown into that hole, all the aforesaid parts will be inflated or blown up.
- Two of these carry about the Vital Humour.**
- The third receives, and casts out the Waters flowing to it.**
- Shelly and Crusty Fishes receive the Waters, that when they remain dry, they may be able to live.** From hence we may guess, that hole, with the common channel, and the three bosoms of Gills, to be a certain *Trachea* or Wind-pipe, into which plenty of water entring at every *Diastole*, is returned back at the next *Systole*: In the mean time, these waters in this passage, do not only Communicate with the Vital Humour, abounding between the Gills, but besides, are laid up between the Cavities of the Members and the Trunk, that they may supply these Fishes, whilst they are kept dry with matter for respiration; and therefore, they not only longer subsist in the open air, but also live for some time in a place void of all air.
- In Crusty Fishes, for that, for the agitating the Gills as it were with Lungs, the Ribs belonging to the Sides, the Muscles of the Breast, and other things are either wanting, or

or by reason of the stiffness of the neighbouring parts, are made unable; it is performed by an admirable artifice, as whilst the Gills, for the most part being loose, and are left easily moveable, the several little bundles of them, about the basis of the bony little Foot, being included with the Muscles, within their Cavities, as it were so many hanging Ribs, are fixed, being drawn forth far beyond the Trunk of the Body; which, as so many distinct Pendulums, by the help of the Muscles, which they include, being almost continually shaken, cause also continual *Systoles* and *Diastoles*, for the inspiring and expiring of the Gills.

The Gills of Crusty Fishes, hanging from the Sides or Ribs, are moved as it were by shaking Pendulums.

But it may well be doubted, whether we ought to assign Souls of the nature of fire, to these bloodless Creatures inhabiting the waters; because they rejoyce in an Element that is deadly to fire it self, and to the Lives of more perfect Brutes: But this Problem shall be satisfied by and by, when we have first discours'd of the Use of the Gills in Bloody Fishes, as also concerning the *Præcordia* of these, and others, of a more frigid blood: In the mean time, the Third Table shews the Figures, representing to the Life the parts of the Lobster.

Whether there be fiery souls in bloodless Creatures.

Secondly, After the bloodless Brutes, their second Class, and of a little higher degree, is that of the more cold bloody Creatures; in which for that the vital Humour or Liquor, being dyed with a reddish tincture becomes bloody, it seems to proceed from a greater plenty of Sulphur, and chiefly destinated for living Creatures, for the increasing their bulk and strength: For where blood is, though in a mean Plenty, their Muscles, Inwards, *Præcordia*, Brain and more strong and compleat Organs of the senses exist. We have observed it otherwise among most Insects, whose little Bodies being ordained to subtle and small actions only, are made up of very little Sulphur, as their *Analysis* or the unfolding them shews, but of plenty of Spirit and of volatile Salt.

From whence the vital humour becomes bloody.

But that among the Bloody Brutes, some are hot in Act, and others are frigid or cold, the reason may be, both from the quantity of Sulphur, to wit, with which they are only meanly or very much imbued, also from the Kind of life which they live, either in the Air, or in the Waters, or within the Earth: Wherefore, the Inhabitants of the latter Regions do not grow hot in the Act, yea 'tis scarce possible they should; for how, or which way should heat subsist, where it is in danger to be damped or overthrown by a more potent Cold? Wherefore, the blood of Animals destinated to these places, is tempered with little Sulphur, lest otherwise growing hot above measure, it should be forthwith suffocated; yea and we suspect the Souls of these, tho of a fiery nature, to have not a flaming *Hypostasis*, but a breathy, to wit, which consisting in Vapour, hardly or not at all inkindled, like an *ignis fatuus* or false fire, is destitute of sensible heat.

Why the bloody Brutes, are some of them more hot Animals, others more cold.

The more Cold bloody Creatures, altho all of them have a *Conic* Heart, very fibrous and thick, to wit, that being strongly Contracted, it might drive forward the Vital Liquor, by a certain Circulation, into all the parts, and from them into it self: yet this Heart in some is two bellied, and to it always the Lungs are hung; in others it hath but one belly; and in many, in the place of Lungs are Gills, but in some there are numerous Wind-pipes, and dispersed thorow the whole Body: We shall consider the different ways and buildings in each of these.

Why some are indued with an heart, with a twofold Belly, &c. Lungs; others with one Belly, and Gills, or Wind-pipes, dispersed.

Among the Brutes of Cold blood, The Earth-Worm, tho of the lowest order, may be rightly placed; for that its humour appears by ocular inspection to be bloody: This little living Creature, tho it be esteemed Vile and Contemptible, hath allotted to it vital organs, as also other *Viscera* and Members, made most admirably by a Divine Workmanship; the frame of the whole Body (even as of many bloodless Insects) is a chain of ringie Muscles, the orbicular fibres of which being Contracted, render every Ring first large and dilated, and then more narrow and longer. For then, when the superior portion of the Body being made long and stretched forth, is extended to a further space, and is there affixed to the plane, the inferior portion of the Body, being relaxed and abbreviated, is easily drawn to it, as to its Centre. A four-fold series or rows of little feet are placed thorow the whole length of the Worm; with these, as it were with so many hooks or claws, he fixes now this part, now that, to the plane or superficies, whilst he stretches forth the other, or draws it after him. Above the opening of the Mouth, he is indued with a snout, with which he diggs thorow and thrusts up the Earth.

Description of an Earth-Worm.

Its local motion.

The little Feet.

Its Snout.

It's Brain.

Oesophagus.

The Earth-Worm, being laid on its back, and fixed with Bodkins to a Table, let it be cut up long ways, then the Sides being layd apart, its parts from the head to the tail easily shew themselves to your view. Above the opening of the Mouth, the Brain appears in a very little Bulk, and whitish like a bubble: Then a little lower, the *Oesophagus* being placed with the Muscles, descends thence with a straight passage to the Ventricle.

Pericardium
and Heart.

White Globes
which are Sper-
matick Bodies.

The like to
these in other
Insects.

The Ventricle,
of which there
are three Bellies
&c.
The Intestine.

An Intestine in
an Intestine,
which is in the
place of the Li-
ver and Mesen-
tery.

The holes in the
back of the
Earth-Worm,
which seem to
be Wind-Pipes.

Nigh to the top of the *Oesophagus*, the Heart beating is placed, having reciprocal turns of *Systole* and *Diastole* or pulses, as in more perfect Brutes: from either side of the heart, and from thence a little lower, are framed whitish Bodies, and something globous or round, and on either side distinguished as it were into Three Lobes. The Two superiour of these, shine more bright and are smaller; the lowest little Globe, greater in a double measure than either of the other, is long and like a Saw-sage; between these whitish Bodies, and more backward, other lesser little Globes as they were small and little yellowish whelks, are placed in a two-fold series, to wit, on either side, now Four, now Five, or more. Noted Blood-carrying passages go thorow the midst of these Bodies, and in them a notable pulsation, as it were in the neighbourhood of the heart, is beheld.

By what names I should call the aforesaid parts, and for what uses they served, I was a long time in doubt, because in the dissection, or by blowing them up with a Pipe, I could find no Cavity in them; but some of the little globes being opened and squeezed, there dropt out of them a milky humour, from whence I presently suspected, that they were spermatick Bodies; which seemed likely, because these parts were not formed after the same manner in all the Earth-Worms. Further, it was sufficiently obvious, that Earth-Worms Coupling together, do not strain themselves as most of the other Brutes, by a direct planting of either Sex about the Tails, but on the contrary, by mutual embraces about the Head. At length, after I had often and narrowly inquired into the matter, it appeared past doubt: For by chance dissecting a certain bigg-bellied Worm, I found the greater white shining Bodies, and the longish like a Pudding or Sausage, stuffed with very many Eggs: Moreover on the other side of these Bodies, in the Breast of the Earth-Worm, appeared two white shining little Paps, with holes, which seemed to be the privy members of the Earth-Worm. *Malpigi* hath observed, in some Insects, and especially in the Beetle and *Imperatus's* Mole, certain little whitish Globes about the Ventricle (like as it seems to these in the Earth-Worms) to be found, and a portion of it, to be compassed with plenty of them: It is very likely that these Bodies are also spermatical in them.

Below these whitish shining Bodies, the Ventricle, of a noted bulk, is placed, indued with a large Cavity, and divided into three Regions or Bellies. From the lowest of these, the *Intestinum* proceeding, is carried by a streight and long passage, even to the Tail, and in the whole space is so compressed, by the several interspaces of the anular Muscles, that it appears like the *Colon* or Arse-Gut in perfect Animals, divided as it were into very many little Cells. This *Intestine* being dissected long ways, and the dung removed, in its bottom was placed a vessel, in its whole passage, of a yellowish Colour, from the Tail even to the Ventricle; but in the same place arising up, and creeping thorow the walls of the Stomach, is stretched forth even to the Head: This Vessel is in truth a Tube, which being blown up by a Pipe, shew'd an ample Cavity; and that which *Malpigi* noted to be stretched forth upon the Ventricle and *Intestines* of Insects, seems answerable to these passages and vessels, and we may well suspect it to be in the place of the Liver and *Mesenterie*. In some Earth-Worms about the Tail, on either side of the *Intestine*, we found sometimes very many Eggs, ready to be lay'd, which indeed were seen to have descended thither, from the genital parts, and were cast out by the Passages lying open into the Arse.

So much concerning the internal parts of the Earth-Worm, opened with its Belly upwards: If the same be held down with its Belly downwards, on the top of the Back, near the brim of every Ringlet, little holes are continued; almost in the whole Passage, from the Head to the Tail; into which, if you blow with a Pipe, presently the underlying parts swell up, the dung of the *Intestine* being driven up and down here and there, backward and forward: From these holes, if they are pressed, a white, viscous, and sometimes a milky Humour drops forth, which seems to be muck or stuff besmearing those Cavities, and fortifying them against the inclemency of the Air.

Without doubt these little holes are so many Wind-Pipes, which as in bloodless Insects, being numerous and dispersed thorow the whole Body, supply the place of Lungs, and draw in the nitrous Air for the inspiring the Vital Liquor, and by and by send it forth being spent. But against this it may be objected, That little and sometimes almost no respiration serves the Earth-Worms: Because they sometimes lye hid in the depth of the Earth, for above three Months, and are able so to ly and to live; yea, if the holes of the Wind-Pipes be smeared over with Oyl, they do not presently dy like the bloodless Insects; but being immerfed in Oyl they swim in it unhurt, and live a long while; but if you apply heat to them, tho moderate, they dy presently: The same thing we have observed almost of Fishes, and especially of the Shelly and Crusty, who bear the defect of Air or Water, better than the presence of Fire, or Heat.

The reason of this (that we may defend our *Hypothesis*) we shall endeavour to shew; we have shewn in a late Tract, That altho Fire and Flame necessarily require, besides Sulphureous food from the matter of the Subject, something nitrous from the Air, which being denyed or withdrawn, they are suddenly extinguished; yet, if that the matter be inkindled of Sulphur and Nitre (as is wont to be in Gun-Powder) together mixed with the Concrete, that Fire or Flame will burn in the midst of the Waters, or in a place Empty of Air; to wit, because either food being contained within, they do not presently desire supplies from without. In like manner we suppose it may be concerning the *Hypotheses* and accensions of Brutal Souls: For altho many of these being inkindled in their vital humour, draw in altogether from the ambient Air, a Nitrous, and from within a Sulphureous Food; Yet in the blood of some of them, which are destinated to the Waters or to the Earth, much of Sulphur thick and Earthy, with little of Nitre, and very little only of spirit and volatile Salt, may be so temper'd that it being inkindled into Life, may burn with a silent and almost suppressed fire; neither requires from without the access, either of much or continued nitrous Food, but, as it hath a certain intestine task, its burning is more securely performed in the Earth or Waters, than in the open Air: For that indeed from this, there is danger of too much inkindling the sulphureous Particles, and so quickly of overturning the *Crisis* or disposition of the Soul: Wherefore, these kind of Animals greatly abhor fire or external heat, which may make the internal Sulphur to work, and too much to burn. However, altho the Souls of these are not contented with fire, and it sometimes as it were hid in the Ashes, suffers them to be nummed or stiff; yet notwithstanding, Organs of Respiration are given to them all, for the continuing it as long as it pleases, and as occasion serves for the increasing or repressing it. And indeed the Creatures of a more frigid blood, appear to be constituted or imbued with plenty of Sulphur, tho sparingly inkindled, because Earth-Worms and Fishes, quickly putrifying, yield a most stinking smell; and the putrified flesh of some of these, by reason of the very many Effluvia's of Sulphur, shine in the dark like a live Coal. Moreover, it hence appears, that the saline Particles, which make up the temperament of these, are for the most part nitrous, and bestowed for the food of Life; because from the bodies of these, dissolved by Chymical operation, you can neither draw a Volatile Salt, as out of all Other Animals, nor a Fixed. The Images of the Earth-Worms, shewing their Anatomy, are described in the Fourth Table.

Earth-Worms and Fishes, abound in nitrous Salt, being almost wholly destitute of a fixed and Volatile Salt.

In the next degree of the more frigid bloody Creatures, above Earth-Worms, Fishes are placed, indued with one belly'd Heart and Gills. If indeed Lungs be wanting to these, the other bosom of the Heart were superfluous. But most Fishes want Lungs, both for as much as living in the Waters (whose medium is not fit for sounds) they have neither voyce, nor make a noyse, and chiefly, because the water ought not to be emitted thorow the Wind-pipe, into all the Cavities of the Lungs, if they had them; for that by watering them, or overflowing them, it would presently overthrow them, and fill them to a stiffness: But as in Brutes with Lungs, the Air being admitted within it, slides thorow all the blood-carrying Passages every where; that entering the little mouths of the Vessels, every where gaping, it inspires the Blood with nitrous food; so the Gills in Fishes, which are substituted as so many Lungs, or rather inverted, are so placed without the Cavity of the *Thorax*, that the Waters continually flowing to the Passages of the Vessels, and their little Mouths being outwardly planted, whilst the Gills are enlarged, they inspire something nitrous, or what is like it, to them; the remains of which, being by and by spent, the Gills being contracted, is sent away again; and so by Continued reciprocations of Inspiration and Expiration as in hot Animals, the Life or the Flame of the Blood is Conserved.

In the next degree of the more frigid bloody Creatures are Fishes.

They are indued with an one Belly'd Heart and Gills.

We have not much to say concerning the structure of the Gills, they being already sufficiently describ'd by several: As to their fabrick, they are bony semi-circles, planted on both sides of the bottom of the Mouth, nigh to the opening of the Gill holes; which are made hollow quite thorow, with little ditches, as it were quills, that they may receive the Vessels sent to them and much branched forth, and defend them against injuries.

The Structure and use of the Gills.

The Vessels belonging to the Gills, are Arteries, and Veins; which in the Sturgeon, Salmon, and Cod, are found to be made after this manner: The *Aorta* going forth of the Heart, and ascending towards the Chin, or end of the lower Jaw, sends forth branches to the right and the left; some of these presently growing forked, accommodate an Artery to two Gills of the same side, which by and by being again divided, puts thorow two arterous shoots, thorow the Bow of every Gill, near to the bony Basis; then from them, others smaller thick set shoots, tend into the sides and midst of every Come-like Finn: After the Gills being passed thorow, all the arterous Branches meet together again, and Constitute the same Trunk, which being by and by reflected, has a prospect

prospect to all the other parts. The Trunk of the *Vena Cava* or hollow Vein descending, applies it self and enters near into the *Aorta* ascending into the Gills. Further, in the several Finns of the Gills, lesser shoots, as in the Bows, answer the greater passages of the Venous, with so many Arterous shoots. Besides, from the several parts on both sides the Gills, a venous branch is inserted into the descending Trunk. This plainly appears, because if you open the branches both venous and arterous, lying on the Bows of the Gills, there will appear a series or row of holes leading into the Finns; Moreover, a black Liquor being cast into those Arteries, will return by the Veins. Yet I have observed, part only of that injected Liquor to turn aside thorow the holes into the Finns, but another part to pass directly thorow into the Channels, and thence to flow into the descending Trunk of the *Aorta*, which the Gilly Branches being at length all united do frame: From hence I gather, That the Blood in Fishes, (not as in Brutes with Lungs) is carried at every Circuit, or passes thorow the Vessels, between the organs of respiration, not all, or whole, or is carried from the Arteries into the Veins, whereby the hole might be inspired anew of the Air; but for that they, as we have shewn, enjoy in themselves a nitrous food partly intestine, therefore it suffices them, that the blood only be by parts exposed to the External Nitre flowing to it.

Not all the Blood, but a part only, is carried thorow between the Gills, at every Circulation.

Fishes breath by the Gills.

From these also it seems to appear, That Fishes do breath by the Gills, or draw what is nitrous from the Waters, and do enjoy it as it were the necessary food of Life; which also many other Reasons do manifestly declare: To wit, for that the Waters where Fishes dwell, standing still a long time, tend to putrefaction; or if by too much Heat or Cold, or other means, by which the nitrous Particles are wont to be driven away or perverted, they be affected, they Choak their Inhabitants. Further, if Fishes be shut up in little water, or with too strait limits, also if more than should be in the same Fish-Pond, tho large enough, tho they have plenty of food, they will dye for want of the nitrous food, which also argues the Cause of their death, for before they dye, they will shoot forth of the waters, putting forth their mouths and heads, to take in the naked Air: so that it may from hence be Concluded, That there are also in these Inhabitants of the waters fire Souls; to wit, the *Hypostases* of which are an heap of most subtil Atoms, which being stirred up into motion, by a certain inkindling, do require, for the Continuing of their substance, besides the Sulphureous Aliment within, which they feed on, another nitrous from the ambient Medium.

wherefore Fishes rejoyce rather in the Waters, than in the Air.

But that Fishes rejoyce in the region of the Water instead of the Air, where any one would think that their Flame should be rather extinguished, than inkindled, we gave the reason of it but now, to wit, as certain Animals are destinated to these places, their Souls were so temper'd, that as the matter made up of Sulphur and Nitre mixt together, they burn or grow hot under the waters, yea they there live more securely; to wit, for as much as there is in them plenty of Sulphur, it is suffer'd to be only sparingly inkindled, and to burn forth. Further, altho some nitrous Particles seem to enter into the intrinsick and ordinary food of the vital fire, and lest the flame, by the defect of these, should expire, new suppliments are daily instilled through the Gills: yet indeed, by reason of the divers Constitutions of Souls, living Creatures do respire after a several manner, and some require this medium more thick, others moderate, and others more thin. And for this Cause, some living Creatures, whilst they remain in the same number, sometimes change their sphere or ambient medium, and sometimes go out of the Waters into the Air, and sometimes from this into them. A certain Insect called the watry *Phrygianion*, in some places in England a *Caddis*, at the first of the Spring is cloathed with a Coat of a sprig or small rind of wood, and creeps into the depth of the Rivers, in the shape of a Mite or rather a Maggot; afterwards, when its Soul begins to be sublimed, he gets to the tops of the Bulrushes, and in the Month of May, rising up to the superficies of the water, puts off its Coat, and having wings, flies into the Air, and there lives during Life. Who knows not that Frogs live at first in the Waters, in the shape of a Tadpole, altogether; then all the Summer do leap about in the Meadows, and that at last in the Autumn, returning to the Waters, do bury themselves in the Mud? After this manner, many more Insects, do not only change the Region, but also vary their Species or Kind, and of Reptils become flying Creatures.

Certain Animals change the Regions of the Air and Water.

Brutes of a more cold blood, which are framed with a Heart with a two-fold Belly, and with Lungs.

Thirdly, A little more superior degree of Creatures of a more frigid or cold blood, is those who are gifted with a doubl'd belly'd Heart, and with Lungs; of which sort are Serpents, Lizards, and some Amphibious Creatures, that is such as live on Water and Land, as the Frogs, and some Fishes, to wit, the *Polypus*, the *Sea-Calf*, with many others. To these former, Lungs are necessary, because they oftentimes live in the open Air, which always ought to be deeply admitted into the *Præcordia* themselves; Moreover, because they put forth a certain sound, for which a Wind-pipe is required; but for

for as much as Lungs are granted to them, so also a two-fold belly'd Heart, without which the blood passes not thorow the Lungs. As to what respects the *Amphibious* Creatures, which at their pleasure now live on the Land, and now in the Waters, tho it appears that these cannot stay always, or very long under the water, yet it is to be wonder'd at, how in the mean time they breath; for if they open the Wind-Pipe, the Waters rushing presently in, would drown the Lungs. *Bartholinus* easily unties this doubt, by asserting, That in these Brutes, an Oval hole as in *Embrio's*, is kept open all their life-time. *Cornelius Consentinus* affirms it after the same manner to be in Divers, or such as dive under the waters; and he shews the manner whereby some men may be made able to dive; to wit, if whilst they are Infants, they be provoked often to Cry, they are suffered a long time to restrain the spirit, from hence there will be a necessity of casting forth the Blood thorow the oval hole or navil, and for that reason will hinder its Coalition or Closing up.

But indeed in these Brutes, as to such a Conformation of the *Præcordia*, the most skilful Anatomist Doctor *Walter Needham* did doubt, and desired to have found it in some of them by an ocular search, after many dissections.

However it is, we are to suppose these living Creatures do not breath, whilst they are under the Waters; and from thence the Course of their Blood is by and by made more slow, and smaller: In which Condition it matters little, whether it so growing torpid or sluggish, creeps from the hollow vein into the *Aorta*, by the navil hole; or whether lying quiet, it creeps forward by a gentle or slow pulse of the Heart; for either way, there will be a necessity, that the Vital fire, for defect of aerial food, would be presently diminished, and as it were depressed into a halituous or breathy substance: Notwithstanding in the mean time, that it may not wholly Expire or be Extinguished, these two things are done, *viz.*

On which the faculty of diving depends.

First, Because in these Animals (and as in all Fishes) the Vital fire, together with a certain Sulphureous and also Nitrous food within (as we have shewed) is enjoy'd; therefore it is able a long time to want its external supplement from the Air.

Then Secondly, in some of them the *Hypostasis* it self, or Constitution of the Soul, consisting of less subtle Particles, is not so suddenly dissolved; but that its parts stick together more strictly among themselves: nor are they wont to be dissipated presently, by any force, as in more hot Animals. Further, as their Souls, as to the greater part by much, subsist in the Brain and Nervous stock, more than in the Blood, it comes to pass, that however this fire being diminished and almost suppressed, the Animal faculties remain still lively enough: and indeed, far otherways than in hot Living Creatures, whose blood being obstructed about the *Præcordia*, presently there follows an Eclipse of the Animal faculties. Notwithstanding, Frogs, Eeles, and Serpents, after their Hearts are taken forth, will live for some time, and leap about; yea, by reason of the animal spirits being intangled with a viscous matter, and not easily dissipable, retain for a little while motion and sense, after their Bodies are cut in pieces, and the several portions divided, and lay'd apart; as we have shew'd before.

The Third and highest Form of Animals, Is that of Creatures of an hot Blood, all which are framed with a two-Belly'd Heart, and Lungs. The Anatomy of these being already so accurately performed by many, and commonly known; there needs not any description of the History and Uses of the Vital or Animal parts, in these kind of Creatures or Brutes.

In the highest form of Animals are those of an hot Blood.

The chief Species of this Kind, are Fowls and Four-footed Beasts, and in the same Class or Rank, we place with the Souls of the later, also the Inferior or Corporeal Soul of Man; and that rightly, because there is the same Conformity in either of their *Præcordia*, of their Brain, and also of their nervous Appendixes; which notwithstanding differs from that of Fowls or Birds. What kind of difference this is, between those and these, as to their Animal parts, we have formerly declared at large; and now we shall notifie what difference happens between them, as to their Vital parts.

They are furnished with a two-fold belly'd Heart and Lungs.

The Lungs of Men and Four-footed Beasts are every where shut in the outmost superficies, that the Air entring by the *Trachea* or Wind-Pipe, and by and by entring into its Channels, quickly blows up all the Lobes of the Lungs, and distends them, but it goes no further: But in Fowls, the Lungs being full of holes, admit the inbreathed Air into the whole Cavity of the Belly, which by the Muscles of the *Abdomen* or lower part of the Belly, is exploded thence. The reason of this I suppose to be in some part, that there may be a greater plenty for singing, and (in some) for the longer tuning of the Voyce, or for the more strong or longer breathing forth of the Air. Besides, (for that all are not singing Birds) it is so provided for, in these Brutes, that by reason of the Trunk of the Body being filled, and as it were extended with Air; they may the more easily fly, and are more easily held up, by the outward Air, by reason of that within.

How the Lungs differ in Birds and four footed Beasts.

For what end the Lungs are perforated in Birds.

Indeed Fishes, that they may the more lightly swim in the Waters, have in their Bellies Bladders blown up with Air. In like manner Fowls, by reason of the Trunk of their Body, being full and as it were blown up with Air, whilst they rely on the open Air, become less heavy, and so fly more lightly and faster. Hence it comes to pass, that men being in danger of drowning, whilst they swim, receive great help by restraining the spirit, and inflating the Breast as much as may be: yea Dead Carcasses being drowned, after the breath or fumes begotten by the inward putrefaction, and shut up within, blow up the fallen Cavities of the Viscera, and extend them more, rise up again, and swim on the surface of the Water.

If we inquire into the Souls of the more hot Brutes, without doubt, it was at first in respect of these, that the Ancients did declare the Soul to be Fire, and the more modern Fire or Flame, these placing it in the Heart, those making it to be inkindled in the Blood: And indeed, since we have granted Souls, as it were fiery, to Bloodless Creatures, and those of a more cold Blood (which also the Lord Bacon grants to Plants) it is not for us to deny the same dignity, in Creatures of a more hot Blood: For besides, that the Souls of those, like Flame, require absolutely either sort of Food; viz. the Sulphureous and the Nitrous, and cannot be a minute without them, the very hot Blood also, is seen, by mere accension (for as much as we cannot shew how it can become so hot after any other way) to boyl up, yea and the Lungs, hanging to the two-bellied Heart, to be the fire-place, chimney, or breathing hole, of the Flame cherished within them. Therefore, as the Soul of the Brute of a more hot Blood, being the perfectest in its Kind, is as it were a Rule or Square, by which others more inferior ought to be measured, and as the same actuating and vivifying the humane body, is subordinate to the Animal, and is the immediate substance of it, (as shall be more fully shown) it remains now, that we inquire into its Nature and Essence, and first of all, that we search into, what parts, powers, and affections she has, which shall be the chief Members of our Psycheology or Discourse of the Soul.

That the Souls of the more hot Brutes is chiefly Fire.

In Man the Corporeal or fiery Soul is subordinate to the Rational.

The parts of the Corporeal Soul.

The Explanation of the Figures.

The First Table,

Contains certain Figures taken out of *Malpighii*, in which the Vital Organs of the Silk-Worm and of other Insects are represented.

The First Figure

Shews the Navil-hole, of which two being planted in the sides of every Section or little Ring (except in the three uppermost) are the Doors or Openings of the Wind-Pipes.

- A. A. The Extremity of the hole, which being black and a little reflected, is united to the Contained Head of the Wind-Pipe.
 B. B. The Head of the Wind-pipe, filling the Hole, in whose middle is a Cleft. C. To which little fibres, like an hairy space, being brought, draw together the gap, or dilate it, that the Air may go out and in at its pleasure.

The Second Figure

Shews some interior Branchings in the Silk-Worm.

- A. A. A gaping, where the head of the Wind-pipe opens into the oval hole or Navil.
 B. B. B. C. C. C. The foldings or ramifications of the Wind-pipe, distributed into the Viscera and other neighbouring parts.
 D. D. Greater Branches, reaching from the lower and upper head of the Trachea or Wind-pipe, towards the other infoldings.

The Third Figure

Shews the Ramifications of the Trachea or Wind-Pipe in a Grasshopper.

- A. The head of the Wind-Pipe opening outwardly into the Hole, by and by is branched forth inwardly into various shoots.

B: The

- B. The greater shoots of the Wind-pipe, being extended by degrees into the Ovals, as it were into bladders.
- C. C. The lesser shoots going from those greater.

The Fourth Figure,

Expresses the Heart of the Silk-Worm, which seems to be made oblong and unequal, as if into many little oval Hearts.

- A. The upper part of it nigh the Head.
- B. The lower part nigh the Tail.
- C. C. The broader part of the Heart.
- D. D. Its narrow portions.

The Second Table,

Of which

The First Figure

Shews the Oyster taken forth and whole from the shell, that his parts may be seen as they are in their natural situation.

- A. The Head of the Oyster, in the Corners of which,
- B. B. The Circular Muscles, going about the whole Body are terminated.
- C. The gaping or Chink leading between the Muscles and Gills to the Mouth.
- D. The superior portion of the Liver, of a brownish colour, leaning to the Ventricle.
- E. E. The Oesophagus leading from the Mouth to the Ventricle.
- F. F. F. F. The Intestine, descending from the Ventricle towards the Corner of the strait muscle, which being from thence bent inward and rolled about, ascends above the Liver, being there hidden, arises again in G : and is terminated in the Arse.
- H. H. H. The skin with the glandulous flesh and fat hiding and lying between the Viscera.
- I. The Cavity in which are the Pericardium, Heart and Vessels.
- K. The strait Muscle, with the perpendicular fibres, opening the shells.
- L. The other strait Muscle, the Tendons of which growing to either shell shut them.
- M. The thickness of the same Muscle, and the altitude of the fibres, are denoted.
- N. N. The Circular Muscles including the Gills from the right side.
- O. The superior Circular Muscle leaning to the Gills, being rolled out of its sight, that the Gills may be beheld.
- P. The inferior Circular Muscle lying under the Gills.
- Q. Q. R. R. R. The Parts of the same Muscles placed on the left side of the Oyster.
- S. The Bosome, where both the Circular Muscles, and their right and left parts coming together, Constitute the Passage, for the admitting the waters to the Gills, and for the shutting them forth from thence.
- T. T. T. T. Four inferior Tufts of Gills which are thinner and broader.
- V. V. V. V. Their superior Tufts thicker and more contracted.

The Second Figure

Represents the Oyster open, and unrolled, that its Viscera and internal parts may be seen.

- A. A. Two Gills dissected from the uppermost, and removed out of their places, that the Mouth of the Oyster may be plainly seen.
- B. The Mouth of the Oyster.
- C. The Veil or Covering of the Mouth.
- D. D. Two other superior Gills in their proper site with the Creeping Vessels.
- E. The superior brownish portion of the Liver under which the Ventricle lies hid.
- F. The Heart made bare from the Pericardium with the broad and blackish Ear of it.
- G. The Aorta, by and by from the going forth of it from the Heart, divided into three branches.
- H. The first Branch ascending towards the Head.
- I. The second towards the strait Muscles.

- K. The third Branch tending into the Gills.
- L. The Trunk of the hollow Vein, entering into the little ear of the Heart.
- M. M. M. M. The Inferior Gills, with the Circular Muscles, cut off from the Body of the Oyster, where they stuck to it, and spread forth, that their Passages and Cavities might be beheld.
- N. N. N. N. The yokings or beginnings of the Gills on which lye the several Vessels, viz. Veins and Arteries; O. O. O. O. and the holes lying between; P. P. P. P.
- Q. Q. Q. Q. The Extremities or fringes of the same Gills.
- R. R. The Inferior Circular Muscle of the right side, out of its site and inverted, that it may be seen.
- S. S. A portion of the same by which it sticks to the bottom of the Oyster.
- T. T. A portion of the same which Compassing the left side of the Oyster sticks to the portion V.
- W. W. The upper Circular Muscle of the right side, folded and contracted, that it may not hide the Gills.
- X. X. A Portion of the same which Compassing about the left side of the Oyster, sticks to the Portion Y.
- Z. Z. The superficies of the Gills, in which the Finns or streaked Passages, for the ingress and egress of the Vital humour and the waters, appear.
1. The lower border of the Oyster, from which the Yoakings and the Circular Muscles are cut off.
 2. A Portion of the Intestine ending in the Arse.
 3. The Arse.

The Third Table.

The First Figure

Shews the Lobster open in the back, that the Brain, Viscera, Vital, Genital, and other interior Parts may be seen.

- A. A. The Brain double, the Hemispheres of which being distinct, are separated one from the other, also a little from the oblong Marrow.
- B. The Head of the oblong marrow, out of which the optic Nerves b. b. and the Mammillarie Processes under them, proceeds.
- C. The Cerebell.
- D. D. Two shanks of the Oblong Marrow, which pass into the Spinal, and as it were two greater Nerves, meet now and then in their descent, and now and then separate, and then again come together.
- E. The Carotis Arterie.
- F. F. A portion of the Oesophagus.
- G. The Opening of the Ventricle.
- H. The upper Orifice.
- I. The Bottom and Lower Orifice near which are three Teeth.
- K. The Temporal Muscles out of their place.
- L. L. Muscles appendixes of the former.
- M. M. Bodies stuffed with pipes and Glandula's or little Kernels, into which passages lye open, from the Ventricle, to whose Sides they grow; these seem to be in the place of the Liver and Mesenterie.
- m. m. m. m. The same Bodies brought lower from either side, and ending in the processes, u. u.
- n. n. n. n. Spermatick Bodies arising on both sides of the Ventricle, which descending under the Pericardium, are terminated in the processes, n. n.
- o. o. Processes out of the Spermatick Bodies, like to the Epididymis, from which are two Yards.
- p. p. Two Yards, in the tops of which, thorow the holes made in the last little feet but one, a passage lyes open.
- q. The hole in the little Foot for the going forth of the Yards.
- R. The Pericardium with the Heart included.
- S. The little Ear of the Heart into which the Vena Cava enters.
- T. T. The ascending Trunk of the Vena Cava.
- V. The Aorta going out of the Heart, cleft into three branches.
- W. The first Branch to its Head.
- X. X. Two other Branches in either Side sent thence to the Gills.

- Y. Y. *The Tops of some of the Gills in view.*
 1.2.3.4.5.6. *Some portions of the Muscles.*
 a.a. a.a. *Ligaments from the Pericardium to the Muscles of the Breast.*
 β.β. β.β. *The Muscles of the Belly, and Breast.*
 γ.γ. γ.γ. *Muscles belonging to the Tail.*
 δ.δ. *The Intestine from the Ventricle to the Arse.*
 ε.ε. *Tubes or Pipes, within which, the Optick Nerves are brought to the Eyes.*

The Second Figure

Shews the Womb of the Lobster, and its Neck, and Privy Member, or aperture made thorow the hole in the last little Foot but one, together with the little Foot it self, and the affixed Gills.

- A. *A portion of the Womb or place of Eggs, full of Eggs.*
 B. *The neck of the Womb.*
 C. *Its Orifice in the hole of the little Foot.*
 D. *The Basis of the little Foot.*
 E. *The little Foot, the shaking of which moves the Gills fixed to it.*
 F.F. *Two Gills fixed to the basis of the little Foot, with Finns or spongy borders.*
 G. *The appendix of the Gills, which like a bladder or membranous bagg, may be blown up and distended.*

The Third Figure

Expresses a portion of the Gill cut off, that its three Passages or Cavities may appear.

The Fourth Table.

The First Figure

Shews an Earth-Worm laid with its belly upwards, the greatest part of it dissected and lay'd open, that the Brain, *Præcordia*, *Viscera*, and other Parts may be seen.

- A. *The Mouth and Chin of the Worm.*
 B. *The Brain, in the superficies of which, an Artery Expanded or stretched out, descends to the Heart, and from thence to the Tail.*
 bbb.b. *Annular or ringie Muscles opened and unfolded with their Tendons.*
 C. *A portion of the Oesophagus.*
 D. *The Heart.*
 E.e.e.e.e. *The upper little white shining Globes, both the greater and the lesser.*
 F.F. *Two lower Globes, bigg and full with Eggs.*
 G. *The Stomach, of which there are three Bellies, 1. 2. 3.*
 H. *The Intestine, descending from the Ventricle, which being bound by the Tendons of the ringie Muscles, appears like the Gui Colon in perfect Animals.*
 I. *A portion of the same Intestine opened, that the Body included in it, or the Intestine in the Intestine may be seen.*
 K. *That interior Body, which seems to be in the place of the Liver, and Mesenterie.*

The Second Figure

Expresses a portion of the same Earth-Worm, with the Tail cut off, that the rowes of little Feet, which are 4, to wit, a.a. a.a. may be seen.

The Third Figure

Shews the whole Earth-Worm prone, or with its back uppermost, that the ringie Muscles, and the Wind-Pipes in them, may be seen.

CHAP. IV.

Of the Parts or Members of the Soul of the Brutes.

*A double Subject of the bruta-
l Soul.*

*The blood or
vital Liquor.*

*The Nervous
juice or animal
Liquor.*

*From hence two
parts of the
Soul,
Flamy and
light.*

THE Corporeal Soul in more perfect Brutes, and common to Man, is extended to the whole organical Body, and vivifies, actuates and irradiates both its several parts and humours, so it seems to subsist in both of them eminently, and to have as it were its imperial seats; But the immediate subject of the Soul, are the Vital Liquor or the Blood, Circulated by a perpetual Circulation in the Heart, Arteries, and Veins; and the Animal Liquor or Nervous Juice, flowing gently within the Brain and its Appendixes: The Soul inhabits and graces with its presence both these Provinces; but as it cannot be wholly together at once in both, it actuates them both, as it were divided, and by its parts: For as one part living within its Blood, is of a certain fiery nature (as we have shown) being inkindled like flame, and the other being diffused thorow the animal Liquor, seems as it were Light, or the rayes of Light, flowing from that Flame; which from thence being Excerpted, and manifold ways reflected and refracted, by the Brain, and Nerves, as it were by Dioptrick Glasses, are diversly figured, for the Exercises of the Animal Faculties.

There are therefore Corporeal Souls, according to its two chief functions in the Organical Body, *viz.* the Vital and Animal; two distinct parts, to wit, flamy and lucid, for what belongs to the said natural function, that indeed is involuntary of the Animal, and is performed by the help of the Animal spirits.

*To which may
be added another the Epi-
physis or dependence of the
whole Soul, viz.
the Genital
part.*

But besides these two members of the Soul, fitted to the individual Body, a Certain other portion of it, taken from both, and as it were the Epitomy of the whole Soul, is placed apart, for the Conservation of its Species: This as it were an Appendix of the vital flame, growing up in the Blood, is for the most part Lucid or Light, and Consists of Animal Spirits: to wit, which being Collected into a certain band, and having got an appropriate humour, *viz.* the genital, are hidden within the spermatick Bodies; to the end indeed, that, when opportunity shall serve, that Band of spirits, as it were a little Brand not yet inkindled, may be able from thence to be drawn into fit fire, and to be inkindled into another Vital Flame, the formatrix of a new animated Body.

*The parts or
Members of the
Soul.*

Concerning these three Members of the Corporeal Soul, two, to wit, the Vital and Animal, fiery by Act, and the other, *viz.* the Genital, lay'd up for a future firing, it should have been particularly and fully here treated on: But since we have already sufficiently discoursed of the two former, I shall only add briefly, by way of Supplement, the Summ of what I have said before, and then we shall also briefly discourse of the be-
getting part of this Soul.

*The Flamy part
of the Soul in
the Blood.*

First, It appears, that the part of the Corporeal Soul rooted in the Blood, is truly flamy, as to which we need only to refer you, to what we have wrote lately in a particular Tract of the Accension of the Blood: For there having shown, the heat of the Blood to be necessarily required, to wit, whereby a greater plenty of spirits may be instilled into the Brain, from its frame being very much loosned; by and by we prove, from those three ways, by which all Liquors whatsoever are only made hot, none can agree with the blood, besides accension or inkindling: For neither by heat put to it, nor by reason of Salts and Sulphurs, which are Corrosives of a divers Kind being put together, can the blood be made to boyl; wherefore it follows, that it is inkindled like the spirit of Wine, and so as it were flames forth and boyls up. Further we shewed, that it is truly inkindled in hot living Creatures, because the proper Passions of Fire and Flame, are found only besides in the Life of the Blood; for in like manner both to this, and to them, there is need constantly of an Internal Sulphureous Food, together with the External nitrous; yea, and either Flame, alike, to wit, the Kitchen and Vital, whilst they burn desire Eventilation. To these may be added, that the Life and Flame of the Blood, as to their Various ways of production and extinction, there particularly described and rehearsed, are wholly after the same manner. Lastly, the analogie or agreement of either Flame, being sufficiently unfolded, we have declared, by what beginnings, the Vital Flame arises, by what degrees it increases, and, after its hight, is diminished; Further, we have shew'n reasons, wherefore this is not visible and destructive as the common Flame, but as it is Subordinate to the Corporeal Soul, as to a Superiour Form, it admitting a proper Species, and serving to the uses of Nature, destinated by the Creator, silently burns with a gentle and friendly heat, like a Fire shut up in *Balneo Maria*, apart by it self; and as it so destroys not the Blood, but inkindling the Liquor even

*Which we have
shewed to be
truly inkindled.*

even so its Superficies, wholly dissolves the frame of the whole mixture; it follows thence, that some particles being burnt, others of a various Kind being manumitted or let go, they are variously employed in the offices of the others; but of these, those which are chiefly Subtil, as it were Beams of Light sent from a Flame, are, as it were distilled into the Brain and Cerebel. These most subtil particles are called the Animal Spirits, and first of all entering the Cortical Substances of those parts, and from thence flowing into the *Medullaria* or middle parts of either of them, and into the Oblong and Spinal Marrow, and further into all the Nerves and Nervous Fibres, dispersed thorow the whole Body, constitute the other and more noble part of the Corporeal Soul, commonly called the Sensitive, by us the Lucid or Etherial; into whose Nature, as also into the ways of its Subsisting, Acting, and Suffering, we shall now in the next place inquire.

Secondly, The sensitive part of the Soul, even as the Vital, is extensive and divisible; whose *Hypostasis* when as the Animal Spirits, as to the Integral parts, do constitute, a great and difficult question arises, concerning them; of what sort of substance they are, and from whence they are indued with so notable an Energy or Power? I shall say nothing to those, who wholly deny these Spirits, for that the existencie of which, is almost palpable, and may be proved demonstratively by the effects; nor am I much solicitous of those, who arguing Contend, that the Senses and Faculties of living Creatures, however perceptive, cannot be but from an Immaterial and Immortal Substance, and therefore without any necessity, multiply almost to Infinity; and I know not for what end, not only Essences, but also immortal Souls of Brutes, yea, of Fleas, Flies, and of other, more vile Insects. Against these Opinions there needs no other Argument, than that any one may consider truly in every Brute or Man, the Organs of the Animal Faculties, than which certainly nothing in the whole nature of things, can be made more Mechanically, and with a more neat Artifice. The Brain and Cerebel, the two Roots of the Lucid part of the Soul, or rather the Fountains of the Primary Spirits, are placed in the top it self of the Body, into which, when the Animal Spirits are distilled, from the Blood, placed above and round about, as it were by a descent; they from thence flow forth through the Medullary and nervous Appendixes, as it were by Bills or Pelicans placed here and there, into all the inferiour parts. Either head consists of a double Substance, viz. a Cortical or Barkie, which for the most part serves for the reception of the Spirits; and a Medullary or Marrowy, which serves for their dispensation and exercise.

The sensitive part of the Soul divisible and extended.

The Animal Spirits constitute its *Hypostasis*.

The Brain and Cerebel, two roots of the sensitive Soul.

Further, as the Animal Spirits, for divers uses of the Animal Faculties, ought to obtain Tendencies or Stretchings-forth of a divers sort, within their distinct and peculiar passages, either Medullary part being wonderfully Divaricated, is cut every where into Various tracts of Labyrinths, as it were so many Conclaves and Chambers; all which Medullary tracts, the Cortical part every where lies between and fortifies; From these, as it were Primary Palaces of the Soul, the Oblong and Spinal Marrow, like spacious Courts are stretched forth, which also are furnished, by reason of the Medullary substances variously lying between, with many Porticoes and Walks, planted here and there, for the necessary works of the Animal Function: From these Marrows, the Nerves arising, are carried to the several parts of the whole Body, as it were so many distinct paths; then from these many other small Shoots or nervous Fibres, being on every side sent forth, as it were so many smaller or lesser Paths, are almost innumerable; at the ends of which, others secondary Fibres, Membranaceous and Muscular, are disposed, though thick Series, as it were so many martial Fields, in every one of which is placed a Maniple or Band of Spirits. In this most ample and highly intricate Labyrinth of Cloysters, and Animal passages, the Medullary or Nervous Processes, how small soever, being most thickly set, variously implicating one another, and ordinarily cutting cross one another, yet all of them distinct, and designed to certain offices, always agree mutually between themselves, and intimately conspire together; so that every Impulse or Instinct, is carried from one end to another presently, yea, from every part to all the rest, sooner than in the twink of an eye. Further, from the effects it is demonstrated, that within these several tracts, some subtil particles do flow, and cause Animal-ty or Life in all; which tho they be most thin, invisible, and nimble, we rightly call the Animal Spirits, and the Constitutive parts of the sensitive Soul.

The substance of them two-fold viz. Cortical and Medullary.

To them are belonging the oblong Marrow, the spinal Marrow, Nerves, nervous Fibres.

Both Membranaceous and Muscular.

A most quick Communication between all these Parts.

Altho it appears plain, that such like Spirits are the Authors of the Animal Function, and do constitute the *Hypostasis* of the Soul it self; yet what they are according to their proper essence, seems hard to be unfolded; because we can hardly meet with any thing in Nature, to which they may be compared in all things.

What the Animal Spirits are.

The comparing of these, with the Spirits of Wine, Turpentine, and Harts-Horn, and such like, does not quadrate or agree. For besides, that those Chymical Liquors, neither represent the Images of their Objects, nor are indued with any Elastic Virtue, as

They are not well compared to Spirits of Wine, Harts-horn, Turpentine, the &c.

Better to the
Rays of Light
interwoven
with the Air,
or the Element.

the Animal Spirits; those also are less Subtle than these, and less Volatil, for as much as they may be poured forth out of one Vessel into another, or may be distilled; but the Animal Spirits presently vanishing, after life is extinct, leave no Foot-steps of themselves. Wherefore, it is better, according to our *Hypothesis*, that we liken these Spirits sent from the Flame of the Blood, to the Rays of Light, at least to them interwoven with the Element and the Air. For as Light figures the Impressions of all visible things, and the Air of all audible things; So the Animal Spirits, receive the impressed Images of those, and also of Odors, and tangible qualities, and stay them at the first Senfory. But the Air, or Aerial particles, whilst free and unmixed, create nothing of force or tumult, yet they being more strictly pressed together, shut up in Clouds or Instruments, or imbued with Sulphureous, and other Elastick Bodies, being become presently raging, they often break forth into Meteors, viz. Winds, Hurricanes, and horrid Thunder. After the same manner, the Animal Spirits, whilst pure, are carried in the open spaces of the Head, and its Appendixes remain quiet enough; but they being shut up within the Muscles, and there being mixed with Sulphureous Particles from the Blood, and sometimes in other places, with an heterogeneous matter, become very impetuous, to wit, Elastick, or Spasmodick or Causing Cramps, as we have declared formerly at large.

The Animal
Spirits abound
both in an Ob-
jective and an
Active Virtue.

Therefore the Animal Spirits, according to this *Analogy*, (to wit, which thing of them happens chiefly and almost only with other things) we say are most subtil Bodies, and highly active, instilled from the inkindled Blood into the Brain, and its Appendix, which partly of their own nature, for as much as they are lucid and aerial; and partly from the agreeable furniture of the Organs, for that they are shut up within Passages, as it were Pipes and other Machines, abound with both an objective Virtue, by which many rays of Light promptly meet together in the Images of all sensible things, and effect the sensation of every Kind, and also, an Active, by which the loco-motive powers, and also the acts of the Spasmodic Affections, are performed, beyond the forces or Instincts of wind, or any blast shut up in machines.

As Fire and
Light in Me-
chanical things
so in Animals,
they are chiefly
Energetical.

In Mechanical things, Fire, Air, and Light, are chiefly Energetical, which humane Industry is always wont to use, for the greatly stupendious, and no less necessary works. This the Furnaces of Smiths, Chymists, and Glass-men, and of other boylers of several Kinds, Dioptrick Glasses, Musical, Warlike, Mathematical Instruments, with many other Machines, never enough to be admired, do testifie. In like manner we may believe, that the Great Workman, to wit, the Chief Creator, from the Beginning, did make the greatly active, and also the most subtil Souls of Living Creatures, out of their Particles, as the most active; to which he gave also a greater, and as it were a supernatural Virtue and Efficacy; from the Excellent structure of the Organs, most Exquisitely laboured, beyond the Workmanship and artificialness of any other Machine.

A two-fold A-
ction of the spi-
rits in the
Brain and its
Appendix, 1.
Of begetting and
dispensation,
2. Of Exercise
and Govern-
ment.

We have described these Parts formerly in Plates, so that we need not here repeat their Anatomy, but only add a few things that were omitted. In the Animal Government, altho the Spirits are disposed, as it were an Army spread abroad thorow the whole Field, yet we say, that they obtain Orders and Offices, one thing in this part, and something different in that. In every one of these we have noted, as it were a double Aspect or Gesture, in the Provinces in the Medullary shanks of the Head, in the Nerves and also nervous Fibres, to wit, one of Begetting and Dispensing, and another of Exercise and Government.

The reason and
manner of the
former.

As to the first, we have shown, that the animal spirits being procreated wholly in the Cortical or Barky substances of the Brain and Cerebel, do descend by and by into the middle or marrowy parts, and there are kept in great plenty, for the businesses of the Superiour Soul; in the mean time, a sufficient stock of these, gently flowing from this highest Province into the oblong and Spinal Marrow, and thence into the Nerves & Nervous Shoots, actuates all these passages, and blows them up into a certain Tensity. Lastly, a sufficient plenty of Spirits, distilling forth from the ends of the Nerves, enter into the nervous Fibres, planted in the Muscles, Membranes, and Viscera, and so constitute them, the proper and immediate Organs of the Sense and Motion. After this manner, the Region of the whole Sensitive Soul being viewed, if we would describe its *Idea* or Image, we must altogether represent the same Figure and Dimension, and the whole Head with its System and Appendix; so that as we may behold all these parts, shadrowed in the same Image, we ought to frame at once, the *Hypostasis* of this Soul, adequate and Co-extended to them.

The distinct Of-
fices of the spi-
rits in various
Provinces.

As to the several sorts of Offices and Exercises of the Spirits, so planted in distinct Provinces, First, we deservedly attribute to them a two-fold Aspect, to wit, inward for Sense, and outward for Motion: But more particularly, we may conceive the middle or Marrow part of the Brain, as it were the inferiour Chamber of the Soul, glazed with

with dioptric Looking-Glasses; in the Penetrabilia or inmost parts of which, the Images or Pictures of all sensible things, being sent or intromitted by the Passages of the Nerves, as it were by Pipes or strait holes, pass first of all thorow the streaked Bodies, as it were an objective Glass, and then they are represented upon the Callous Body, as it were upon a white Wall; and so induce a Perception, and a certain Imagination of the things felt: Which Images or Pictures there expressed; as often as they import nothing besides the mere Knowledge of the Object, then by and by further progressing, as it were by another waving, from the Callous Body towards the Cortex or shell of the Brain, and entering into its folds, the phantasia vanishing, they constitute the memory or remembrance of a Thing: But if the sensible species being impressed on the Imagination, promises any thing of Good or Evil, presently the spirits being Excited, respect or look back upon the Object, by whose appulse they were moved, and for the sake of embracing or removing it away, by other spirits flowing within the Passages of the Nerves, and successively by others implanted in the Members and moving Parts, they swiftly give their Commands of performing the respective motions. So the Sense brings in the Imagination; this the Memory or the Appetite, or both at once, and at length the appetite stirs up local motions, performing the prosecution or driving away of the appearing Good or Evil. For the several Kinds of these sort of Animal Functions, yea for the Various Acts of either Kind to be performed, the Animal Spirits, who are the immediate Instruments of them all, obtain peculiar and distinct tracts or paths; within which, if there be any let or bar to hinder, presently some function is hindered, or some member of the sensitive Soul, being as it were cut off, becomes impotent.

The perception of Sensations in the streaked Bodies.

The Imagination, Phantasia, and Appetite, in the Callous Body.

The memory and remembrance of a thing, or reminiscency within the folds of the Brain.

The series and order of their powers.

Who can sufficiently admire the innumerable series of nervous Fibres, distributed in a most wonderful order thorow the several parts of the whole Body; in which the animal spirits, like Soldiers sent abroad, perpetually running up and down, on this side and on that, perform the offices of Sense and Motion. Further, those who dwell within the Head it self, the superior Legion of the sensitive Soul, altho more freely ranging, yet lye not disorderly or loosely, but its numerous Company, being limited with certain Bounds and Cloysters, as it were within the narrow space of One Chamber, perform infinite Variety of Actions and Passions.

The tracts or paths of the Spirits, are distinct within the head it self, even as within its nervous Appendix.

Concerning these, discoursing formerly more fully in our description of the Brain and Nerves, we did distinguish the Seats of all the Faculties, yea we did shew the Commands of the Animal Function voluntary and involuntary, to be divers in themselves, also to belong to divers Governments of the Brain and Cerebel, with their respective appendixes of the Nerves. Further, we shewed that those Spirits, the Authors of either function, not only within the narrow Channels of the Nerves, but also in the large meeting places or *Emporiums* of the Head, have peculiar paths, to wit, the medullary tracts, as it were intrinick Nerves, most curiously stretch'd forth here and there. But indeed, because it is objected, that I have not described all, and perhaps not exactly enough; therefore, that those medullary Passages may be the better beheld, we have lately instituted another more accurate anatomy of the Brain; to wit, by gently scraping with the point of a Pen-knife its parts, we removed every where the softer and brownish substance, a-Kin to the Cortex of the Brain, the whiter and more hard being left; by which means, in several places of the Brain and the Oblong Marrow, many Medullary Chords or Strings, as it were distinct Nerves, wonderfully Communicating among themselves, and with other white or medullary Bodies, were brought into sight. For as much as this Anatomical Administration, render'd the more secret passages of the Spirits, and the motions belonging to the Arcana's of the animal Government, very Conspicuous; we shall here shew a new Figure or two of the Brain rolled forth, and the flesh when taken off in the chief places; in which are plainly beheld, both the Common Passages, and the Private paths of the Spirits, and which carry them backward and forward, immediately thorow the beaten way of the medullary tail, and which lead thorow the by-paths of the Prominences, into the streaked Bodies.

Every where the various Medullary tracts, are distinct from the Cortical.

A more exact Anatomy of the Brain, through its Cortication or Shelly part.

The Common passages, and the private paths of the Spirits.

Therefore, in the Brain taken out, and rolled abroad according to our Method, let there be a dissection so made, between the Orbicular Prominences, to wit, between the Testes or Testicles, Nates or Buttocks, that when they being whole, and divided in the middle of the Pinal Glandula, the parts are layed by themselves, the streaked Cavity of either may be lay'd open. (As in the 6th Table, Fig. 1. A. b, E. A. b. c. c. D.) Then it will easily appear, that the said Prominencies, called the Testes, are marrowy Epiphyses (or additions) of the oblong marrow, which sticking to the tails of the Cerebel, from thence look towards the Brain, and a Commerce is seen to be maintained between this and that.

To wit, which thorow the orbicular prominences, are the Testes and Nates.

This last Epiphysis, passes from the parts of the Brain, into the next natiform (or of the form of a Buttock) B. which is an adjunct, or some Augmentation of that: To this

E

Medullar

Medullary *a.a.* in a Sheep, Ox, and many four-footed Beasts, grows a Cortical Substance *B.B.* But otherways in a Man, Dog, Fox, and other more sagacious Creatures, it is marrowy thorow the whole; the reason of the difference, I have shewed in another place.

The description
and use of them.

This medullary *Epiphysis* reaching above the *Testes* and *Nates*, and going under the Pineal Kernel, tends towards the Chambers of the Optick Nerves; approaching which (*F.*) by and by it is cleft into two Branches, as it were Nervous, one of which *G.* is carryed to the Cone of the streaked Body, and the other *H.* towards its Basis, and in its oblique passage, sends a shoot into the midst of the Border of the streaked Body: this Branch going to the basis of the streaked Body, behind the root of the *Fornix*, is inserted into an Angle of the streaked Body.

From these;
Medullary
tracts into the
streaked Bo-
dies.

As to the Use of these Parts, we have proposed our Conjectures in our Tract of the Brain; and truly nothing seems more probable, than that by this side-path of the Prominences, and by the Passage of the Medullary Passages, there are Commerces held between the Brain and the Cerebel; for as often as it happens, that Impressions or Instincts meerly natural, follow spontaneous Affections and Motions, or are joyned to them, all that, within those private Tracts, is occupied. See our *Anat. of the Brain*, p. 176. Further, whereby every such Impression from the Viscera or Precordia, by the mediation of the Cerebel, are carried from them in the same way forward and backward, into the streaked Bodies, and on the contrary every force and perturbation; The Medullary passage, which is for their commerce, enters in three places, viz. In the middle, and at either end, into the streaked Bodies.

And wherefore.

To the Prominences which are called *Nates* and *Testes* succeed the Chambers of the Optick Nerves *E. E.* as also above the Medullary Trunk, certain *Epiphyses* or Additions, serve for a private office viz. only for the visive Function. For as the sight is a most noble faculty, and as the Organ of the eye is highly curious, so it obtains a very spacious Furniture or Porch, and also a very strait, to the common Sensory, viz. the streaked Bodies: Because the Optive Nerves coming together, under the Trunk of the oblong Marrow, and being by and by disjoyned, they climb up his sides, where going under the appropriate Protuberances, they go into a numerous company of hairy threads, which are every where interwoven with the cortical Substance. *Fig. 2. Tab. 6.* These Medullary or Nervous structures or bindings, which without doubt the visible Species pass thorow, are all parallels, which, being stretched forth Strait, are brought to the streaked Bodies, every where, through their whole Compass. *Fig. 2.* Hence it is probable, the causes of the Sandy drops or Spots, yea, and of the sight otherways depraved or lost, do lie hid, not only in the Eye and Optick Nerve, but sometimes in these parts; for much as those Filaments or Nervous threads, being obstructed or bound together, the visible Species are not able to beam themselves to the streaked Bodies. I knew one, being affected, by his Imagination and Memory being grievously hurt, that those diseases vanishing, fell into blindness: The reason of which accident seems to be, that the morbidick matter occupying at first the superior frame of the Brain, being slid thence lower by the Cortex, at length enter'd into the Optick Chambers.

The description
of them.

The use.

There remains yet a private passage of another sense, to wit, of the smelling, to the common Sensory, viz. the streaked Bodies; The mamillary Processes being entered into the Prominences of the Inferiour Brain, go under its Basis till they come to the border of the streaked Body on both sides, then being a little bent inwards: they proceed by an oblique passage towards its Basis, where they are inserted. *Fig. 1 Tab. 6.*

The Mamillary
Processes, are
carried by a
private passage,
to the streaked
Bodies.

As to the Impressions of the other Senses, and to the force and Instinct of every Spontaneous motion, carried up and down, there is a necessity, that all these Kinds of Commerces, between the streaked Bodies and the Nervous Appendix, should be made by the Shanks of the longish Marrow: The tops of these being large and broad, stick to the hindermost borders of those, so that from these into those, and so on the Contrary, a going and returning is easily performed. Further, that the many and divers motive and Sensible Forces and Impressions together, may be carried without confusion, by this beaten and common way, the whole frame of the Medullary Shanks, appears thorow the whole to be made with Nerves or Medullary strings compacted together; as if they were so many distinct paths, in this common passage of the Animal Spirits, for the inculcating the Various acts of the Senses and of Motions. The Sixth Table represents these parts to the Life.

The common
passage of the
Spirits, to the
streaked Bo-
dies, is made
by the shanks of
the oblong Mar-
row.

The chamfer'd or streaked Bodies, consist of a most exquisite and greatly to be admired Fabrick: The figure of either, coming something near the Cone, appears like a Cone reflected and bent inward; the outmost and superior Superficies is round and Barkie, thorow which creep Blood-carrying Vessels, and a portion of the *Choroidal* Infolding hides it; The middle and inferior frame of them consists of a Medullary Substance, with a Cortical mixed between. *Tab. 8th l. m.* The sides or either border of these, both the

An accurate de-
scription of the
striated or
streaked Bo-
dies.

Superior

Superior and Inferior, are for the most part Marrowy, and look white like the greater Nerves; n. K. Between these streaks or Marrowy strings, thick set, and of a divers magnitude, being stretched forth like the greater Nerves, Knit together, both the Borders: The anterior Border n. n. is every where knit to the Callous Body; so that whatsoever is to be carried forward and backward by either, viz. from one to another, we suspect they have for it this passage between those Medullary passages. The hindermost Border of the streaked Body, in its upper part, receives the Medullary Processes sent thither from the round Prominences, and also the Optick Chambers, into its Bosome: In the middle and lowest part, either Border is fixed to the Shanks of the oblong Marrow; and nigh to the Basis of the Fornix, the inferior Border of one streaked Body, is continued into the other Border; to the end, that these Bodies also might have between themselves a mutual Commerce, which is also observed almost of all the rest of the Parts of the Head, that they are double, and do communicate among themselves, by certain passages; so that if one part should be faulty, its defect might be made up by the other being whole.

As to the Offices and Uses of the streaked Bodies, though we can discern nothing with our eyes, or handle with our hands, of these things that are done within the secret Conclave or Closet of the Brain; yet, by the effects, and by comparing rationally the Faculties, and Acts, with the Workmanship of the Machine, we may at least conjecture, what sort of works of the Animal Function, are performed in these or those, or within some other parts of the Head; especially because it plainly appears, that the Offices of the Interior Motions, and Senses, as well as the Exterior, are acted by the help of the Animal Spirits, ordained within certain and distinct Paths, or as it were small little Pipes.

The use or Offices of the streaked Bodies.

As therefore it appears from what we have said, that the chamfered or streaked Bodies are so placed, between the Brain and Cerebel, and the whole nervous Appendix, that nothing can be carried from these into that, or on the contrary be brought back hither, but it must pass thorow these Bodies; and as peculiar passages lead into these most ample Diversories, from the several Organs of Motions, Sense, and the other Functions; and further, as Passages lie open from these into the Callous Body, and into all the Marrowy Tracts of the Brain, nothing seems more probable, than that these parts are that common Sensory, that receives and distinguishes the Species, and all Impressions, transfers them, being ordained into fit Series, to the Callous Body, and represents them to the Imagination there presiding; that also transmits the Force and Instincts of all spontaneous motions, begun in the Brain, to the Nervous Appendix, to be performed by the motive Organs. By reason of these manifold and divers offices, so many Marrowy streaks or internal Nerves are produced within the streaked Bodies, for the Various Tendencies and Beamings forth of the Animal Spirits, it may very well be concluded that the Sensitive Soul, as to all its Powers and Exercises of them, is truly within the Head, as well as in the nervous System, merely Organical, and so extended, and after a manner Corporeal.

They receive the Impressions of sensible things: and convey the Instincts of Motions.

The Explanation of the Figures.

The Fifth Table,

Shews the Figure of the Brain of a Sheep roled forth, and derafed, and as it were made bare of the Flesh, in many places, that the Marrowy Tracts may be seen.

- A. A. The Medullary Protuberances called Testes, which being certain Epiphyfes or excrescences of the oblong Marrow, and joyned to the Trunk of the Cerebel look thence towards the Brain.
- B. B. The Natiform Protuberances, the Substance of which in a Sheep, a Goat, and many others, is partly Cortical, a. a. partly Marrowy, b. b. in a Man, Dog, Fox, and others it is wholly Marrowy.
- C. The Cavity or Ventricle, lying under the Prominences, which is lay'd open, these being dissected and opened.
- D. D. Two Marrowy Chords or strings of the Medullary Trunk, going strait to the streaked Bodies.
- E. E. The Chambers of the Optick Nerves.
- e. e. The parts of the pineal Kirnel, cut thorow the midst, and laid apart.

- F.F. The Medullar or nervous passage proceeding from the Prominences, which presently becoming forked, sends forth one branch G. to the Cone of the streaked Body, and the other H. to its Basis.
- I. A shoot from the medullary Branch, going towards the Basis of the streaked Body, reaching into the midst of its Border.
- K. The latter border of the streaked Body, receiving the nervous passages, and under the root of the Fornix, united to its like Border of the other side.
- L. The whole streaked Body with its Vessels creeping thorow its Cortex or shell.
- M. The other streaked Body, with the shell scraped off, that the Nerves or marrowy Traits may appear.
- N.N. The foremost border of both the streaked Bodies, Conjoynd to the Callous Body.
- O. The Basis of the Fornix.
- P. The Trunk of the Fornix Cut off, and with the Brain rolled out, removed at a distance.
- Q.Q. The two roots of the Fornix.
- R.R. The interior superficies of the Callous Body, noted with transverse medullary streaks.
- S. A medullary hedge or mound, dividing the streaks of one side, from those of the other.
- T.T. Portions of the Brain Cut off and rolled forth, which (as also its whole Frame) appears with a marrowy, and a Cortical substance intermixt.
- V.V. Portions of the divided Cerebel lay'd apart.
- W. The Portion of the Oblong Marrow situated beyond the Cerebel.

The Sixth Table,

Shews the Basis of a Sheeps Head, in certain parts of which Derafed, and in others Exposed naked, the Streaks or Medullary Traits, as so many Nerves, appear.

- A.A. The Mamillary Processes carried to the Basis of either Streaked Body, and inserted into them.
- B.B. Some remaining portions of the Brain cut off from its greater bulk.
- C.C. The streaked Bodies derafed, and as it were made bare of flesh, that the Medullary streakes may appear also in its lower parts.
- D.D. The Chambers of the Optick Nerves, in which the strait and thick-set Medullary streakes, are reached forth, towards the streaked Bodies.
- E. A Trait leading to the Tunnel of the Brain.
- F. A Kirnel placed behind the Tunnel, which is twofold in man.
- G.G. The Trunks of the Optick Nerves divided, and removed, from their joyning together before the Tunnel.
- H, H. f. f. The Shanks of the oblong Marrow lying under the Orbicular Prominences, in which strait and most thick streakes are also stretched forth towards the chamfer'd Bodies.
- I.I.I. Transverse Medullary Traits distinguishing the regions of the oblong Marrow.
- K.K. Ringy Processes compassing about the oblong Marrow, nigh the Cerebel.
- L. The extremity of the oblong Marrow going into the Spinal.
- M. The Top of the Spinal Marrow.

The Seventh Table,

Shews the orbicular Prominences, and the Optick Chambers Erafed, and as it were made bare of Flesh that their inward Frames may be beheld.

- A.A. The Testes, which thorow the whole being Medullary, are marked with strait Fibres.
- B. The Nates, one of them being Derafed, in which the strait and thickest Medullary streakes, are stretched forth towards the Brain.
- C. The Medullary Hedge or Mound, dividing the Natiform Prominences from the Optick Chambers, and from which, one Medullary Process is carried into the Basis of the streaked Body, and the other into its Cone.
- D. One Optick Chamber scraped, that its strait and most thick-set streakes, stretched forth towards the streaked Body, may appear.

- E. The hinder Border of the streaked Body, receiving the Optick Medullary streakes, and other Medullary Proceffes.
 - F. The streaked Body decreased, whose little Medullary Nerves and Passages, are explained in the 5th. Table.
 - G. The foremost border of the streaked Body.
 - H. The Bosome, leading from the Mamillary Procefs into the Ventricle of the forepart of the Brain.
 - I. I. The Hemisphere of the Brain opened and seperated by it self.
- The rest here described are explained in the former Figures.

CHAP. V.

The Beginnings and Increase of the whole Corporeal Soul ; also some Innate Habits and Inclinations of it are noted.

FROM what has been said, concerning the *Hypostasis* and Members of the Corporeal Soul, or of the more perfect Brutes (which is also the inferiour Soul of Man) it will be easier to trace out the Original, and the Increase of the whole: From hence also we may collect its figure and dimensions, as also the proportion, habits, and inclinations of its parts, in respect of it self, and the members of the Body, together with its Various ways of acting and suffering.

As to the first beginnings or original of the Corporeal Soul ; this, (like as a Shell-fish forms and fits its shell to its self) exists something a little sooner, and so more nobler than the organical Body ; Because a certain heap of animal Spirits, or most subtil Atoms, or a little Soul not yet inkindled, lies hid in the Seminal humour ; which having gotten a fit cherishing or Fire-place, and at length being inkindled from the Soul of the Parent acting, or endeavouring, or leaning to it, as a flame from a flame, begins to shine forth, and to unfold it self, a little before the Foundations, or first ground-work of the body is lay'd : This orders the web of the conception, agitates and inkindles the applied matter, disposes, and by degrees forms the Figure, designed by the Archetypal Law of Creation. In this stupendious Fabrick, together with its bodily bulk, being daily increased, and Imaged into the due Species of each animal, the Soul also takes its increase, and still renders it self like to the Body, which it forms. For when as the more thick particles, from matter continually put together, are bestowed in the Corporeal Organs ; in the mean time, the more subtil and spirituous being loosned, and more rarefied, by the burning of the others, they dilate the *Hypostasis* of the Soul, and together with the Body unfold, and equally extend it. But that after this manner, the Seeds of the Soul being laid, from the beginning, together with those of the Body, do rise up to a due figure and bulk in either, it ought not to be attributed to the fortuitous concurrence of Atoms, nor to the proper Energie of the Soul it self ; but the beginning of all things, proceeds wholly from divine Providence, directing Generations, to the Ends and Ideas of Forms, according to the original Types primitively ordained by the same.

Secondly, As the Increase of the animated Body, and the first marrying together of the Elements proceed from this Soul, informing and disposing the matter ; so the duration and subsistence of the same Soul, is the Bond of its Mixture or Concretion. For the flame of the Soul being extinct, or the inkindling and motion of the subtil particles ceasing, presently the frame of the Body it self begins to be dissolved and loosned, so that in a short time, the Elements being loosned and lax'd one from another, fly away, and by degrees break their Concretion : wherefore this Soul, as it were salt or pickle preserves the fleshy bulk of the Body from putrefaction ; yea, the same is almost in an animated Body, as the Flower or Spirit in Wine, which indeed being present, and unfolding its spirituous Particles thorow the whole, the Liquor continues still generous and flourishing ; but as soon as this Spirit of the Wine flies away, forthwith the remaining water or liquor degenerates into an insipid and dead thing.

Thirdly, So long as this Soul subsists in the Body, according to an ancient saying of *Hypocrates*, It is always Born, even till Death ; In which respect also, it seems to be most like flame, or rather the same thing, which is continually renewed almost every moment : Some parts of eithers subsistence, in like manner are consumed by burning, and fly away, and others in the mean time are laid up anew, from the Food continually laid in : For as the

The beginning of the Brutal Soul.

Frames it self before the Body.

And increases likewise with it.

The duration also of the Body depends upon the Soul.

The Soul always Born.

more

The Offices of the
Organs and Fac-
ulties, were-
ciprocal to-
wards one ano-
ther.

more Cras or thick Particles of the nourishing juice, wrought in the Viscera, fill up the losses of the Corporeal bulk, so the more subtil make up the layings forth or wastings of this Soul; which, as they come to the blood, are as it were Oyl to a Lamp, and being perpetually inkindled within its bosom, restore to the Soul both Flame and Light, which would otherways perish. For whilst the purer part of the nourishing Liquor, cherishes the flame of the Blood, and sustains it, the most Spirituous Particles falling off by its burning, are insilled into the concavity of the Head, which there propagate and nourish the other part of the Soul, to wit the Sensitive: So the making of Blood, is owing very much to Chylification, or the making of the Chyle, and Animality, or like to this; notwithstanding which offices, the Animal Function payes back to the Vital, and both to the Organs of Chylification; for as much as the Animal Spirits, bestow a pulsifick force to the Heart and Arteries, whereby the Blood may be agitated and carryed about, to the places of accensions or inkindlings: yea, the Viscera of Concoction, receive heat which they want, from the flame of the Blood, and a motive and sensitive virtue, which they have need of, for their Offices, from a Constant afflux or flowing in of the Animal Spirits; so the Brain is indebted to the Heart, and both of them to the Stomach, yea, and on the other side, this Region to that, and both to the third. To the end that the *Hypostasis* of the whole Soul might the longer continue, the Tributes of all the Parts are Compensed with mutual Offices one to another, and so at once the members both of the Body and of the Soul being conjoyned, by a Circular necessity, they desire and shew their mutual Labour.

It is natural to
the Soul to de-
fend it self, and
to propagate its
species.

Fourthly, The Soul of the *Brute*, as it is Fire, according to Philosophy, has these two innate Dispositions by the Law of Creation, to wit, that it should defend it self, or delay its proper inkindling long, for whose sake it is still careful of taking of food; and also, that it might propagate its Species, or produce other Souls; for which end, it Continually lays up from its provision, an incentive matter, and Continually desires to expose it to an inkindling.

Hence the young
one as soon as it
is born, seeks
for food.

It is natural for every Animal, without guide or example, to take its proper food; and to Swallow it down, both that the web of the Body being daily increased, might grow to its due magnitude, and also that the Soul, as it were its woof, being daily supplied with new plenty of Spirits, may be able to be Coextended or stretched forth equally with the Body, and able to perform lively the Acts of its Functions. Then as soon as the Lineaments, both of the Body and the Soul, being sufficiently drawn forth, and the Compass and Bulk of each Completed, some Animal Spirits, superfluous from the individual work, begin to abound, and so separate into the genital parts, with a Subtil humour, picked from the whole Body, as it were into a Store-house, destined for the propagating the Species, and there being lay'd up, forme the Idea of the Animal, which afterwards is transferred into a fit Matrix, for to be perfectly formed.

When the Indi-
viduum is made
the genital hu-
mour, for the
propagating the
Species, is
lay'd up.

The Genital
Humour, not from
the Brain, but
from the Blood.

The genital Humour, is not, as *Hippocrates* formerly taught, and as now commonly believed, carried from the Brain into the Spermatick Vessels; for no peculiar passages lye between that, and these Bodies far remote; but without doubt, the bloody mass it self, sends its most noble part into the Genitals, as well as into the Brain. Wherefore, when as there are no Nerves that reach to the Testicles, and that there are noted Arteries sent, and admirably made thorow wandering Passages and frequent engraftings of the Veins; to wit for that End, that they may carry the most pure flower of the Blood, as it were thorow the winding Channells of an Alembick, distilled by a long passage, and so wrought and made most highly subtil, into those parts: what is superfluous of this or less clarified, the Veins do not only receive and carry back, but also because from the much Spirit, a great quantity of Serous water (which serves always for its Vehicle) abounds, therefore the Water-Carryers are produced in these parts abundantly more than in any others.

why the loss of
seed disturbs the
Brain and
Nerves.

But that a great loss of the genital Humor doth hurt very much the Brain and the Nerves, and bring to them a notable debility; the reason is, because the blood as it makes up the losses of the seed, destined for the propagating its Species, carries thither and bestows whatsoever is most precious of its own; in the mean time, as the Brain is defrauded of its due provision, by the great plenty of Spirits being carried into the Spermatick Bodies: yea as the blood is not able sufficiently to impart to the Genitals, out of its proper store, it remands or snatches its Tribute from the Brain and other parts, that it might be there bestowed; so that not seldom the strength of the whole Soul and Body is consumed, on the mad insatiate fulfilling of Lust or Venus; and in these desires, everyone, or the unskilful, complains of Flames, and feels the blood not only to flame forth, but a greater fire increasing, to make hot the marrow, yea oftentimes it is known to burn up the Flesh, Inwards, and Bones, and to reduce them to a rottenness.

As to that most quick and Intimate Commerce of the brain, with the genital Members, for as much as the Venerian imagination Causes presently an insurrection in these parts, and on the other side a swelling up of the seminal humor, stirs up the Venerial Imagination; the Cause is, not an Instinct thorow the private passages of the Nerves; (which are wholly wanting) reciprocated from this to that; but, because for the Act of Generation, greatly necessary, and performed with a most vehement Affection, one part of the soul by it self, or one part after another is not moved, but the whole *Ekstasis*, together, and on a sudden, and is inclined or snatched towards the Genitals; hence every most light incentives of Lust, are most swiftly poured forth thorow the universal parts of the Soul, fiery of themselves, and Extremely perclive or apt for such fires.

From whence is this Wonderful Commerce of the Brain, with the Genital Members.

Whilst this Corporeal Soul, being inkindled like flame, in the animated Body, on every side diffuseth Heat and Light, we may take notice of its various tremblings, shakings, inequalities, and irregular Commotions; these sorts of Irregularities, to be observed, concerning the *phasis* or appearance of this Soul, of which we treat, tho they are more perspicuous in Man than in Brute Animals, yet they altogether respect the inferior Soul of Man, which is Common to him with the Brute Animals. But that we may briefly handle some of these Affections of the Corporeal Soul, first it is to be noted, that its flame does not always flame forth equally: For besides that its food is sometimes afforded more plentifully, and too sulphureous, sometimes more thinly and less inflameable, so that the Flame is enlarged or Contracted, its accension also, in the præcordia, tho of it self moderate and equal, is wont to be variously shaken, by the fanning of Passions, so that it is carried forth sometimes into an Excessive burning, as from Anger and Indignation; sometimes this vital flame is in danger to be always blown out, as by sudden Joy, and another time almost suffocated, as by sudden fear or sadness; In like manner the *Systasis* or Constitution of the Soul, from the rest of the Affections, being exposed as flame to the winds, is diversly changed in its appearance, as will more clearly appear, when we shall speak particularly of its Affections.

The Soul, like Flame, has in equalities Tremblings &c.

The Flame of the Soul is sometimes enlarged by passions.

Nor do these sorts of Inordinations only proceed from the sudden impulses of Passions, but sometimes, the Vital flame, habitually becomes decayed, weak, and as it is were half extinct, as by intemperate Cold, and also as is observed in the plegmatick disease, the dropsie, longing of maids, and other diseases; in whom the Blood being too watery, like moist and green wood, sends forth but a small and inconstant flame and almost overwhelmed with fume and vapour: But sometimes the bloody Liquor being more sulphureous than it ought, is almost wholly inkindled, as happens in a Choleric Complexion, and in an intemperate Feavor: According to either of these hights, as the inkindling of the vital flame is altered, so the lucid particles, which flow from it, to wit the beamie texture of the Animal spirits, diversly shines, and breaths forths from the decayed or bound up inkindling of the Blood, the sphere of the sensitive soul is seen to be straitned, and to be drawn in, within the limit of the Body, and to be immersed or sunk down so that it doth not sufficiently actuate or illustrate the whole frame of the Brain, and its Appendix: On the Contrary, when the Vital Fire is very strong (so it doth not burn forth too much and feavourishly) the Constitution of the Animal Spirits being made greater in it self, is much enlarged forth far beyond the Compass of the Body, so that any one exulting for Joy, or blown up with pride, is seen to grow very great, and not be able to be contained within its proper Dimension.

Sometimes Contracted

The same habitually is now decayed.

Now intense or strong.

Also the lucid part of the Soul shines diversly

And is altered on the part of the Flame.

Besides these Kind of Alterations, which the Soul properly sensitive, or the lucid part, receives, from the Vital and flammie, variously changed; many other things happen, which disturb its *Systasis* or Constitution, and its wonted manner of Order, immediately both from a certain affection of the Brain, and Nervous stock, and also from external Objects because in the night, the Brain it self, from a too great infusion of the nutritious Juice, or from the black darkness, or vapours, is filled, so that the lucid part of the Soul in sleep, is wholly obscured, as it were with darkness; not seldom from a morbid matter somewhere gathered together, and as it were obstructing the Spirits, or the ways of their Beams, there arises an Eclipse of some or more of their faculties; sometimes the Animal Spirits themselves are not light or airy enough, but are infected with heterogeneous effluvia's, to wit, either Saline, Vitriolic, Nitrous, or otherwise Cloudy, which deform the sensible species, change them into some affrightful thing, and excite inordinate Motions: Hence it comes sometimes that the whole Soul suffers various Metamorphoses or Changes, and puts on strange species's, as often happens in Melancholy diseases, or to mad men.

Also from the various affection of the Brain and Nervous stock,

As to the various gestures of the Soul, by which for the variety of sensible objects it expresses now Joy and Pleasure, by and by loathing and trouble, it is observed, that sometimes it is allured more outwardly by the Organ of this or that sense, and as occasion serves almost wholly to wander into the Eye or Ear, Palate or any Sensory meeting with some-

Also from the various incur-sions of sensible things.

something pleasant; sometimes on the Contrary, for the sake shunning or flying away from some approaching evil, that she retires inwardly, and leaving her watch, hides her head; To that we think or Imagine nothing without being touch'd, but that the whole Soul almost is moved, and trembles at every apprehension of the sensible object, and its *Systasis* is variously agitated, as it were the leaves of a Tree, exposed to the blasts of Winds.

Alterations of the Flamy part of the Soul impressed by the Lucid.

Nor do these sensible Impressions induce Metamorphoses only to the sensitive soul, or the beamy Texture of the Animal spirits; but undulations or waverings being brought to it, presently they go forward, and impress alterations on the vital Soul, lying in the blood, and move about its flame, as it were with blasts, driving it hither and thither, and unequally inkindling it. For as we mentioned before, the same moment, in which an object carried from the sense or memory, stops at the Imagination, as that Comes under the shew of good or evil, it affects the Animal Spirits destined to the Motion of the Precordia, and causes the Precordia, by the influx of them, to be variously Contracted or dilated, and for that Cause it is, that the inordinate motions, and inkindling of the Blood, are so performed. But of these there will be a more opportune place of treating, when we shall speak especially of the Affections of the Soul.

CHAP. VI.

Of the Science or Knowledge of Brutes.

WE have hitherto spoken of the Original Nature and manner of the Soul of the Brutes, subsisting in the Body, as also of its various degrees or species, and as it hath in the more perfect Living Creatures Parts or Constitutive Members. Further, the *Hypostasis* figure, and dimensions of the same Soul, being rightly delineated, we have Considered, how, that she is capable of Impressions from outward Objects, also to what passions and alterations besides she is obnoxious: yet from all this furniture of the Corporeal Soul, and of its powers being put together, it doth not plainly appear, what the same is able to do beyond the Virtue or force of any other machine, and to perform by its own proper Virtue or strength. For altho an Impression of an Object driving the Animal spirits inwards, and harmonizing them by a certain peculiar manner, causes sensation; and the same spirits, for as much as they leap back from within outwardly, as it were by a reflected undulation or waving, stir up local motions; yet it is not declared how this Soul, or any part of it, perceives it self to feel, and is driven according to that perception into divers Passions and Actions, directed to the Appetite or desire of this or that Action; and sometimes, as we have generally observed in some Beasts, for the prosecution of the desired thing doth pick out and choose Acts, which seem to flow from Council, or a certain Deliberation. In Man indeed it is obvious to be understood, that the Rational Soul, as it were presiding, beholds the Images and Impressions represented by the sensitive Soul, as in a looking Glass, and according to the Conceptions and notions drawn from thence, exercises the Acts of Reason, Judgment, and Will. Yet after what manner in Brutes, Perception, a discerning or discrimination of Objects, Appetite, Memory, and other species or Kinds of Inferiour Reasons as one may say, are performed, seems very hard to be unfolded; therefore, when some could not solve this Knot or difficulty, they attributed to Brutes Immaterial Souls, and subsisting after their Bodies. Which if that were true I know not why Four footed Beasts should not be indued with reasoning and understanding as well as man, yea and might learn Sciences and Arts; for as much as in either, besides their immaterial souls alike, there is altogether the same Conformation of the Animal Organs; upon which indeed it appears, that the Rational Soul whilst in the Body, hangs or depends as to its acts and habits, because the Organs being hurt, or hindered, a privation or an Eclipse of these succeeds: wherefore that the Soul of the Brute using the same Organs as man, can Know nothing clearly, nor rise above the Acts and material Objects, it plainly follows, that she is different from the Rational Soul and also that she is much inferiour and Material.

The Soul of the Brute is strong in sense and motion as a Machine.

But wonderful how by perception.

If the Soul of the Brutes be immaterial, it is also rational.

But that it is objected, that all matter whatsoever is not only insensible and sluggish, but also meerly passive, therefore incapable of sense and animal activity, omitting here many instances of æquivocal productions, the *Epicureans* affirm to be equally

equally stupendious and inexplicable, of which we shall discourse anon; we shall propose as to the former, this one thing, as very Consistent to our *Hypothesis*; to wit, that there is not much more difference between an insensible and a sensible Body, than between a thing unkindled, and a thing kindled; and yet we ordinarily see, this to be made from that; why therefore in like manner, may we not judge a sensible thing, or Body to be made out of an insensible? Every matter, as it is not Burnt, so not animated; but being disposed, by either of the active Elements, it becometh it to be indued with Spirit chiefly, with Sulphur and Salt: Combustible things, as Oyl, Rosin, Wood, and the like, of themselves torpid and sluggish, lye unmoved without fire, heat, or some agitation of the parts or particles: But as soon as they have taken flame, from some incentive being put to it, by and by their Particles being rapidly moved, and as it were animated, produce a shining with Heat and Light; and not only make light all about them, but Create innumerable Images, of all things that are seated near them, and thickly object them on every side: In like manner, the Vital humour in an Egg, remains torpid and sluggish in the beginning, and like to unkindled matter; but as soon as it is actuated, from the Soul being raised up, presently like an inkindled fire, it excites Life with Motion and Sense, and in the more perfect Creatures with heat. Further, the Animal Spirits as Rays of Light, proceeding from this Fire, are Configured according to the Impressions of every of their Objects, and what is more, as it were meeting together with reflected irradiations, cause divers manner of motions.

A sensible thing or Body, is produced from an insensible, as an inkindled Body from one not kindled.

Then what is vulgarly delivered, that Matter, out of which Natural things are made, is merely passive, and cannot be moved, unless it be moved by another thing, is not true; but rather on the contrary, Atoms, which are the matter of sublunary things, are so very active and self-moving, that they never stay long, but ordinarily stray out of one subject into another; or being shut up in the same, they cut forth for themselves Pores and Passages, into which they are Expatiated.

That matter is not merely passive.

Yet it may be argued, That if the Soul of the Brute be Composed out of these, whilst the same is Extended and is Corporeal, it cannot perceive. For it admits the Species of the Object into its whole self, or into some part of it self, not the first, because then neither the Senses would be distinguished one from another, nor any of them by a perception or common sensation of these: But if (as indeed it is) it shall be said, that all the sensible Species being received by appropriated Sensories, to a certain part of the Soul, to wit, the first or common Sensory, where they are perceived: Then it may be again objected, That so manifold and divers Species or Images of sensible things, which at once are Conceived, from Objects, cannot be painted forth in a certain small part of the Brain, but that some should obliterate or blot out, or at least Confound others: I say none ought to wonder, who hath beheld the Objects of the whole Hemisphere, admitted thorow an hole into a dark Chamber, and there on a sudden upon Paper exactly drawn forth, as if done by the Pencil of an Artist: Why then, may not also the Spirits, even as the Rays of light, frame by a swift Configuration, the Images or Forms of things, and exhibit them without any Confusion or Obscuring of the Species?

But sometimes too active.

The common Sensory is not the whole Soul, but a certain part of it.

This receives all species without Confusion.

But yet, tho it be granted, That the Images of sensible things are represented in a certain part of the Soul, to wit, actuating the Brain it self; to which there happens a most speedy Communication, with the whole, and also with the several Parts: however, we are yet to inquire of what Kind of power that is, which sees and knows such like Images there delineated, and also according to those Impressions there received, chooseth Appetites, and the respective Acts of the other Faculties.

How this perceives that her self feels or knows.

That we may go on to Philosophize concerning this matter, I profess indeed, whilst I consider the Soul and the Body, to wit, either of them by it self and distinct, I cannot readily detect, in this, or in that, or in any material subject, any thing, to which may be attributed such a Power, with a self-moving energy: But indeed, when I consider the animated Body, made by an Excellent and truly Divine Workmanship, for certain Ends and Uses, nothing hinders me from saying, That it is so framed by the Law of Creation, or by the Institution of the most Great God, that from the Soul and Body mixed together, the same Kind of Confluence of the Faculties doth result, by which it is needful for every Animal, to the Ends and Uses destinated to it.

In most Mechanical things, or those made by humane Art, the Workmanship Excels the matter: who would think there could be an Instrument made out of Iron or Brass, being most fixed and sluggish Mettals, whose Orbs like to those of the Celestial, without any external Mover, should observe almost continual motions, the Periods of which being renewed at a constant turn or change, should certainly shew the spaces of Time? No Body admires that a rude and simple sound is given by wind, blown into a Pipe; but indeed, by Wind sent into musical Organs, and that being carryed variously thorow manifold openings of Doors, into these or those pipes, that it should create a most grate-

As in mechanical things, so much more in an animated body the work is more excellent than the matter.

A self moving
musical Organ.

To which the
soul of the Brute
is like.

The more per-
fect Brutes are
indued with
knowledge.

That is either
inbred.

Or acquired.

What natural
instinct is.

What it brings
to the Brutes.

Some examples
and instances of
it.

ful Harmony, and Compos'd Measures of every Kind; this I say deservedly amazes us, and we acknowledg this Effect, far to Excel both the matter of the Instrument, and of the hand of the Musitian striking it. Further, altho the Musical Organ very much requires the labour of him playing on it, by whose direction, the spirit or wind being admitted, now into these, anon into those, and into other Pipes, causes the manifold harmony, and almost infinite Varieties of Tunes; yet sometimes I have seen such an Instrument so prepared, that without any Musitian directing, the little doors being shut up, by a certain law and order, by the mere Course of a Water, almost the same harmony is made, and the same tunes, equal with those Compos'd by Art. And indeed Man, seems like to the former, in which the rational Soul, sustains the part of the Musitian playing on it, which governing and directing the animal spirits, disposes and orders at its pleasure, the Faculties of the Inferior Soul: But the Soul of the Brute, being scarce moderatrix of its self, or of its Faculties, Institutes, for Ends necessary for it self, many series of Actions, but those (as it were tunes of harmony produced by a water Organ, of another Kind) regularly prescribed by a certain Rule or Law, and almost always determinated to the same thing.

This indeed holds good, concerning the more imperfect Brutes, in whose Souls or Natures are inscribed the types or ways of the Actions to be performed by them, which they rarely or never transgress or go beyond; and that according to the vulgar saying in the Schools, *They do not so much act, as are acted*: yet in some more perfect Brutes, whose Actions are ordained to many and more noble Uses, there are far more Original Types, and to their Souls there ought to be attributed a certain faculty of Varying their Types, and of Composing them in themselves; for the Brutal Soul it self, being so gifted naturally, as she is Knowing and Active, concerning some things necessary for it; she is taught through Various Accidents, by which she is wont to be daily affected, to know afterwards other things, and to perform many other, and more intricate Actions: But how all this may be done, (without calling an immaterial Soul into play) to wit, by what helps, whether innate or adventitious, or acquired, the Science of the Brutes is gotten or polish'd, will be worth our Labour to shew a little more fully: that it may appear at length, what is the utmost thing that living Brutes can know or do, and how far that is below the power of the Rational Soul.

Therefore, that we may seek out as it were the several footsteps, by which all brute Animals are imbued with the Knowledge of things; we ought first to distinguish here, that some of their Knowledge is born with them, as we but now hinted, to wit, for some Uses needful for the lengthning of Life, being infused by the most high Creator, and impressed like a Character, from their first formation, on the beginnings, or on their very Natures themselves, which is wont commonly to be called *Natural Instinct*: But others acquired, to wit, which by degrees is learned, by the incursion of sensible things, Imitation, humane Institution, and other ways, and is carryed to a greater degree of Perfection in some than in others; yet in some, this acquired Knowledge, as also Cunning, depend wholly on the natural Instinct, and being polished by frequent use and habit, and Carried a little further, seem to be certain additions only.

First, As to what regards natural Instincts, it is a great and most ancient Notion, That there is in all Living Creatures, an innate Conservation of themselves, to wit, that every Individual might preserve it self as long as it can: This is a Law of Divine Providence, inbred in all Creatures, which gathers together the Principles of Life like a Bond, otherways apt to be dissipated and to depart one from another, and on which, as the Basis, the Duration or Continuance of the whole World stands.

This being supposed, it necessarily follows, that all Animals ordained for this end, are furnished also with certain fit means, for following the same, wherefore they ought to know by Natural Instinct, whatsoever things are Congruous and benign, and what are incongruous or hurtful to them, and that they should follow these with hatred and aversion; and those with Love and delight. Hence it is, that every one of them are able to choose Food proper for themselves, and to seek it being absent, and remote from their Eyes; And from an implanted disposition of their Nature, are skilful to know and oppose Enemies, to love their Friends, to get a female fit for themselves, and to make ready whatever may conduce to the Procreating and Cherishing their Young; besides many other Kinds of powers and habits, granted to us not without Learning and Study, are originally fixed on the *Præcordia* of the Beast.

And truly, if we look upon the Ingenuity and Proprieties of all Animals, we shall find these Kind of Effects after a manner in all: For many of them are no sooner brought to light, but they seek and greedily embrace remedies against hunger and Cold, without any guide or shower; then being somewhat grown up, tho Carefully Kept from all their Companions, yet without any one to shew them, or any example,

they

they of their own accord perform the peculiar Actions of their Kind. A Lamb just brought forth, and scarcely out of the after-birth, presently snatches at and sucks the Duggs of its Dam. A Chicken, as soon as out of the shell, will pick up grains of Corn, hides it self under the wings of the Hen, and flies from the approach of the Kite. Cattel feeding in the Pastures, are more Skilful than Men, about the Virtues of Herbs; for they easily discern at the first tast, what are for food; what for Medicine, yea, what is to be shun'd, being imbued with poyson and death; when we in the mean time, unless taught by experience, are wholly ignorant of their Virtues or poysonous force: so that *Pliny* Complained, that it was a shame, that all Animals knew what was healthful for themselves, besides Man.

Natural Instinct dictates to Brutes, what is wholesome and what unwholesome.

Neither does what some object otherways determinate this matter; that the means of these Kind of effects, depend only upon the similitude or the dissimilitude of Patricles, which are in the sensible and the Sensory, without any intention of the Beasts, or End of their Acting; because we have observed, that Brute living Creatures, by the Virtue of natural Instinct, perform not only simple actions, stirred up by one Impression of the External agent, as when the heat of the Sun invites to take the Cool of that shade, but they perform and do manifold works, and Continued by a long Series. Birds by reason of the Influence of the Spring, being instigated to the begetting others apply themselves to that business, without any other provoker or director, as it were Consultingly and premeditated; for they enter into wedlock, as it were by a solemn manner of Espousals, they choose a fit place for the building their nest or habitation, where they make it most artificially beyond the skill of humane Architecture; then they lay Eggs, and by sitting on them bring forth young ones, and then carefully nourish them with food which they get for them. We might here also take notice of the most admirable Republicques of Bees and Ants, in which, without any written Laws or promulged Right, the most perfect ways of Government are exercised. But as in all these without any Variety, one thing is always and wholly after the same manner administred, it is a sign, that these Kind of principles or beginnings of the Brutes, are nor stirred up either by external objects, whose Impulse is still various and divers, nor from an internal proposition of the Mind, which is more mutable than the wind; But excited from a more fixed and Certain principle, determinate always to one thing, which can be only Natural Instincts: The World is full of Examples of this sort, which testifie the native indowments and implanted Ingeny of Brutes: For in all Animals, there are by Nature a Certain Ingeny and habit born with them, by which they are instigated through a secret impulse and blind power to the performing of Actions, which respect both the Conservation of themselves, and the propagation of their Kind; and these Gifts being originally granted, constitute as it were the first lineaments or groundwork of practical Knowledge, with which the Soul of Brutes are wont to be imbued: then an acquired Cognition being superadded to those rudiments, fills up the vacuities of those things drawn forth, and adds a perfection to the former foundation.

Leads not only to simple Actions but also to very Complicate Actions.

But yet those always, and in all, of one Kind only.

For Secondly, besides the natural Instincts, living Brutes are wont to be taught by sensible species, to wit, to profit in the Knowledge of several things, and to acquire certain habits of practice: But this happens not equally to all nor at all times. For in many Animals newly brought forth, natural Instinct is of some force, but then the Impressions of sensible things little or nothing affect the sensitive soul: Because, altho the flamy part of the Soul is enough inkindled in the Brain, yet because the Brain and its Appendix, abounds with much humidity, therefore the Spirituous Effluvias, or the lucid part of the Soul which ought to irradiate these Bodies, is very much obscured, as the beam of the Sun passing thorow a thick Cloud: Wherefore at this time, the strokes of sensible things, being not deeply fixed, are presently obliterated, and in them local motions hardly follow: yea in some Beasts, in whom the Blood being continually and habitually thick, and who have a less Clear Brain, tho through their whole Life some acts of the Exterior Senses and Motions are performed, yet few Characters are left, of any interiour Knowledge. Wherefore, we shall here inquire only concerning Brutes, that are more docil, to wit, in whom are besides local motions, and the five Exterior Senses, Memory, and Imagination; and in these we may conceive this kind of Introduction, or Method of Institution, concerning the Exquisite Knowledge, by the sense with which they are wont to be imbued.

2. Brutes, in some things, are taught by the Impressions of sensible things.

Therefore, as soon as the Brain in the more perfect Brutes grows Clear, and the Constitution of the Animal Spirits becomes sufficiently lucid and defecated, the exterior Objects being brought to the Organs of the Senses, make Impressions, which being from thence transmitted, for the continuing the Series or Order of the Animal Spirits inwards, towards the streaked Bodies, affect the Common Sensory; and when as a sensible impulse of the same, like a waving of Waters, is carried further into the Callous Body,

The direct sensible Species creates in them the Phantase and the Memory.

The reflected
be Appetit e.

The Appetite
stirs up local
Motion.

Which being of-
ten stirred up
produce an ha-
bit of Acting.

and thence into the *Cortex* or shelly substance of the Brain, a Perception is brought in, concerning the Species of the thing admitted, by the Sense, to which presently succeeds the Imagination, and marks or prints of its Type being left, constitutes the Memory; But in the mean time, whilst the sensible Impression being brought to the common Sensory, effects there the Perception of the thing felt; as some direct Species of it, tending further creates the Imagination and Memory; so other reflected Species of the same Object, as they appear either Congruous or Incongruous, produce the Appetite, and local motions its Executors; that is, the Animal Spirits looking inwards, for the Act of Sensation, being struck back, leap towards the streaked Bodies; and when as these Spirits presently possessing the Beginnings of the Nerves, irritate others, they make a desire of flying from the thing felt, and a motion of this or that member or part, to be stirred up: Then, because this Kind, or that Kind of Motion succeeds once or twice, to this or to that Sensation, afterwards, for the most part, this Motion follows that Sensation as the Effect follows the Cause: and according to this manner, by the admitting the Ideas of sensible things, both the Knowledge of several things, and the habits of things to be done, or of local Motions, are by little and little produced: For indeed, from the beginning, almost every Motion of the animated Body is stirred up by the Contact of the outward Object; to wit, the Animal Spirits residing within the Organ, are driven inward, being stricken by the Object, and so (as we have said) constitute Sensation or Feeling; then, like as a Flood sliding along the Banks of the shore, is at last beaten back, so, because this waving or inward turning down of the Animal Spirits, being partly reflected from the Common Sensory, is at last directed outwards, and is partly stretched forth even into the inmost part of the Brain, presently local Motion succeeds the Sensation; and at the same time, a Character being affixed on the Brain, by the sense of the thing perceived, it impresses there, Marks or *Vestigia* of the same, for the Phantasie and the Memory then affected, and afterwards to be affected; but afterwards, when as the Prints or Marks of very many Acts of this Kind of Sensation and Imagination, as so many Tracts or Ways, are ingraven in the Brain, the Animal Spirits, oftentimes of their own accord, without any other forewarning, and without the presence of an Exterior Object, being stirred up into Motion, for as much, as the Fall into the footsteps before made, represent the Image of the former thing; with which, when the Appetite is affected, it desiring the thing objected to the Imagination, causes spontaneous Actions, and as it were drawn forth from an inward Principle. As for Examples sake, The Stomach of an Horse, feeding in a barren Ground or fallow Land, being incited by hunger, stirs up and variously agitates the Animal Spirits flowing within the Brain; the Spirits being thus moved by accident, because they run into the footsteps formerly made, they call to mind the former more plentiful Pasture fed on by the Horse, and the Meadows at a great distance, then the Imagination of this desirable thing, (which then is cast before it, by no outward Sense, but only from the Memory,) stops at the Appetite: that is, the Spirits implanted in the streaked Bodies, are affected by that Motion of the spirits flowing within the middle part or Marrow of the Brain; who from thence presently after their former accustomed manner, enter the origines of the Nerves, and actuating the Nervous System after their wonted manner by the same Series, produce local Motions; by which the hungry Horse is carried from place to place, till he has found out the Imagined Pasture, and indeed enjoys that good the Image of which was painted in his Brain.

3. Brutes are
also taught by
experience.

After this manner, the sensible Species being intromitted, by the benefit of the Exterior Organs, in the more perfect Brutes, for that they affix their Characters on the Brain, and there leave them, they constitute the Faculties of Phantasie and Memory, as it were Store-houses full of Notions; further, stirring up the Appetite into local Motions, agreeable to the Sensations frequently, they produce an habit of Acting; so that some Beasts being Taught or Instructed for a long time, by the assiduous Incurision of the Objects, are able to know and remember many things, and further learn manifold works; to wit, to perform them by a Complicated and Continued Series and Succession of very many Actions. Moreover, this Kind of acquired Knowledge of the Brutes, and the Practical habits introduced through the Acts of the Senses, are wont to be promoted by some other means, to a greater degree of perfection.

For in the third place, it happens to these by often Experience that the Beasts are not only made more certain of simple things, but it teaches them to form certain Propositions, and from thence to draw certain Conclusions. Because, draught Beasts, having sometimes found water to be Cooling, they seek it far as a remedy of too much heat; wherefore, when their Precordia grow hot, running to the River they drink of it, and if they are hot in their whole Body they fearlessly lye down in the same. In truth, many Actions which appear admirable in Brutes

came

came to them at first by some accident, which being often repeated by Experience, pass into Habits, which seem to shew very much of Cunning and Sagacity; because, the sensitive soul is easily accustomed to every Institution or Performance, and its Actions begun by Chance, and often repeated, pass into a Manner and Custom. So it happens sometimes by Chance, among Hounds, that one had caught the prey, not exactly but by following a Shorter way; this Dog afterwards, as if he were much more Cunning than the rest, leaves the Hare making her turnings and windings, and runs directly to meet her another way.

Living Brutes are taught by Example, by the Imitation and Institution of others of the same or of a divers Kind, to perform certain more excellent Actions. Hence it is that the Ape so plainly imitates Man, that by some, it is thought a more imperfect Species of him. For this Animal being extremely mimical, as it is indued with a most Capacious and hot Brain, it imitates to an hair, almost all the Gestures that it happens to see, presently with a ready and expeditious Composing of its Members, and is furnished with a notable Memory, and retains all its tricks which it has once acted very firmly afterwards, and is wont to repeat them at its pleasure. They are very admirable habits, which Horses, Doggs, and Birds get, being carefully instructed by the Discipline of Man; and not only from Men but being taught first by their Companions, they imbibe altogether new and more Excellent Customs: so one Dog ordinarily teaches another to hunt, and one Bird another to compose harmonious notes and various tunes. It were an Easy matter to bring very many Instances of this Kind. But we shall hasten to other things.

Having thus enumerated the Chief Helps from Nature and Art, by which living Brutes do profit in the Knowledge of things, and are instructed by the Habits of Acting, we shall now inquire, to what height most of them or all of them put together, can arrive.

First, from what we have said 'tis clear, that Living Brutes are directed to all things which belong to the Defence and Conservation of the Individuum, and that are to be done for the propagation of their Kind, by a natural Instinct, as it were a Law or Rule fixed in their Hearts: when as therefore we behold for these ends, ordained by Divine Providence, Brutes to order their matters wisely, and as it were by Council, no man Esteems this the work of Reason, or of any liberal faculty; yea they are led into these enterprises, by a certain Prædestination, rather than by any proper Virtue or Intention.

Secondly, The Natural Instinct of Brutes, happens, not rarely, with notions acquired by the sense, and being Complicated with them conduces to the Propositions or Assumptions to be done, Concerning many things, and the Deductions to be drawn from thence. A Dog being by a staff struck, or by the flinging of a stone, perceives the hurt received by the senses, and easily retains the Idea in his Memory, but the Instinct dictates to him that the like stroke may be shunned afterwards, wherefore, when he sees a staff held out before his eyes, or a stone taken up, fearing thence the like hurt, he hastily flies away.

Thirdly, sometimes Instincts, and also all other acquired Knowledges, are mixed together, either with the Example of Habits, or with the general Institution of things learnt: And when as notions so arising from one faculty or power, answer to Actions drawn from another, from thence is produced a certain Kind of Discourse or Ratiocination, and often times it is continued by a certain Series or Thrud of Argumentation. Many admirable Histories are reported, concerning the Subtilties and Craft of the Fox, which he is wont to perform for the getting of his living. This Creature, that he might allure the Hens within the Compass of his Chain, with which he was tyed, lying all along, his legs stretched forth, feigns as if he were dead, then they coming near him, he readily leaps upon them. Moreover, I have heard it told, that a wild Fox, that he might get into his clutches a Turkie Cock roosting in a Tree, running round the Body of the Tree, with a swift Motion, continually beheld the Bird with an intensive Eye, by which Means, as the Turkie still followed the Fox thus running Round with his eye, carrying his head about till being infected with a giddiness, he fell down from the top of the Tree, into the mouth of his Enemy: I say, it was natural to the Fox, that he should desire domestick Fowl, as his prey; but that he should frame these Kind of Snares for them, this he must have by former acquired Knowledges, from Sense, Experience, and Imitation, and complicated with natural Instinct. It is very likely that the Fox had learnt by former Experience, that the Hens did not fear him lying as dead, which might happen by Chance, when being wearied, or to sleep, he had lay'd himself on the ground: In like manner, perhaps, when he had run about the Tree, seeking some way to get up into it, the Prey might fall down into his mouth; Wherefore afterwards when he would take his prey, he repeated the Series of the same Actions; because, what

4. By Example, Imitation, and Institution also

How far it is that Brutes are able to know.

How natural Instinct is wont to be complicated with acquired notions, with the Impressions of sense, &c.

With Habits learnt from Example or Institution.

With notions learnt from Experience and Imitation.

The Syllogisms
of Beasts.

he had known to be done before, he presumed might be done again. In both Cases, and in others like them, the reason of the whole thing done, or the Endeavour, is resolved into these Propositions; The Fox thinking, now to take the Prey, that is before his eyes, after what manner he may, remembers how he had taken the same formerly, by these or those sort of Cunning ways or Crafts, found out by some chance; These are the Premises, the former of which is suggested from Nature, and the second from Sense and Experience, from whence a Conclusion follows, Therefore Foxes for the taking of their Prey, use again the same Wiles. According to this sort of *Analyzing*, the most Intricate Actions of Brutes, which seem to contain Ratiocination, may be explained, and reduced into Competent notions of the sensitive Soul.

CHAP. VII.

The Corporeal Soul, or that of the Brutes, is Compared with the Rational Soul.

Three heads of
this Discourse
viz. 1. It is
shown that the
Rational Soul
far exceeds the
Brutal.

2. How both
Souls are joyned
in Man, and
3. How they
frequently disa-
gree among
themselves.

The Priority of
the Rational
Soul as to

1. The Objects
which are E-
very Ens.

2. The Acts of
Knowing.

The first Act of
either Soul is
simple Appre-
hension.

The power of
this in Brutes
is Phantasie or
Imagination.

Which is often
deceived.

In man it is the
Intellect pre-
siding o'er the I-
magination.

FROM what we have said is to be understood, how much it is that Brute Animals are wont to do with the whole furniture of the Corporeal Soul, and to obtain towards the use of Reason: But now we shall endeavour to shew, how far they are below it, and how much less they are able to do than Man, endued with a Rational Soul. The means of observing the difference between these Souls are commonly to be had, being noted by divers Authors both Ancient and Modern and both Philosophers and Theologists, till it is almost worn thread-bare, yet we will take leave to shew you only some few select things, which for Methods sake, we shall reduce to these three Heads: viz. 1st. It is shown, That man using expeditiously and freely the Powers of the Superiour Soul, of the Intellect, Judgment, Discourse, and other Acts of Reason, shews them far excelling any Faculty or Science of the Brute, and the whole power of the Corporeal Soul. 2. By what Knitting the Corporeal Soul, and the Rational are joyned together, in the Humane Body, by what means they agree in the same habitation; also what offices they perform each. 3. Shall be declared, for what means, and for what occasions these Souls differ among themselves, yea sometimes are wont to dissent and move more than Civil Wars.

The eminency of the Rational Soul above the Brutal or Corporeal, shines clearly by comparing either, both as to the Objects, and to the chief Acts or Modes of Knowing. As to the former, when as every Corporeal Faculty is limited to sensible things, and every one of these to certain Kinds of things, the object of the humane Mind is every Ens, whether it be above, or sublunary, or below the Moon, Material or Immaterial, true or fictitious, real or Intentional; wherefore *Aristotle*, who seemed to hesitate something about the Nature of the Rational Soul, hinting its acting Intellect as if it were Immaterial and Immortal, doth pronounce it not only separable and without Passion, but also unmixed because it understands all things. *Lib. de Anima 3. Cap. 4.*

Secondly, The Acts or degrees of Knowledge, Common to either Soul, are Vulgarly accounted these three. To wit, simple Apprehension, Enunciation, and Discourse; how much the Power of the Rational, excels the other Corporeal in each, we shall consider:

First, The Knowing Faculty of the Corporeal Soul is Phantasie or Imagination, which being planted in the middle part of the Brain, receives the Sensible Species, first only impressed on the Organs of sense, and from thence by a most quick Irradiation of the spirits delivered inwards, and so apprehends all the several corporeal things, according to their Exterior Appearances; which notwithstanding, as they are perceived only by the sense (which is often deceived) they are admitted under an appearing, and not always under a true Image or Species. For so we Imagine the Sun no bigger than a Bushel, the Horizon of the Heaven and the Sea to meet, and then the Stars not to be far distant from us in the Horizon, and that in respect of us, there are no Antipodes; further we may think the Image in the Glass, or in a Fountain delineates it self, that the Echo it self is a Voyce coming from some other place, that the shore moves being on the water, yea and many other things, being received by the Sensorics, whilst Phantasie is the only guide seem far other ways than indeed they are: But indeed, the Intellect presiding o'er the Imagination, beholds all the Species deposited in it self, discerns and corrects

corrects their obliquities or hypocrites the Phantasie there drawn forth sublimes, and divesting it from matter formes universal things from singulars; moreover, it frames out of these some other more sublime Thoughts, not Competent for the Corporeal Soul: so it speculates or Considers both the nature of every substance, and abstracted from the Individuals of Accident, viz: Humanity, Ratiotinality, Temperance, Fortitude, Corporeity, Spirituallity, Whiteness, and the like; besides, being carried higher, it Contemplates God, Angels, It self, Infinity, Eternity, and many other notions, far remote from Sense and Imagination. And so as our Intellect, in these kind of Metaphysical Conceptions, makes things almost wholly naked of matter, or carrying it self beyond every sensible Species, consider or beholds them wholly immaterial, this argues certainly, that the Substance or Nature of the Rational Soul is Immaterial and Immortal: Because, if this Aptness or Disposition were Corporeal, as it can conceive nothing Incorporeal by Sense, it should suspect there were no such thing in the World.

Which discerns the errors of this.

Sublimates its notions, & divests them from Matter.

Contemplates Immaterial Substances.

The Second Act of either Soul is Enunciation.

Secondly, It appears clearly, from what was said before, that Phantasie, or the Knowing facultie of the Corporeal Soul, doth not only apprehend simple things, but also Compose or Divide many things at once, and from thence to make enuntiations: Because living Brutes, in various objects together, which are for food, discern things Convenient from others Inconvenient or unfit; moreover, they choose out of these, things grateful before others less grateful, and get them sometimes by Force, sometimes by Cunning, and as it were by stealth. A Dog knows a Man at a great distance; if he be a Friend, he runs to him and fawns on him; If an Enemy and fearful, he barks at him or flies at him, but if armed or threatening him, he flies away from him. These kind of Propositions the Brutes easily conceive, for as much as some Species of the sensible thing being newly admitted, meets with Species of one thing or other before laid up in the memory, or being suggested by a Natural Instinct, associates with them or repulses them. But indeed, how little is this, in respect of the humane Intellect? which not only beholds all enunciations conceived by the phantasie, but judges them, whether they be true or false, Congruous or Incongruous; orders and disposes them into Series of Notions, accommodated to speculation or practise: Moreover, it restrains the phantasie it self, being too instable and apt to wander through various phantasies; it calls it away from these or those Conceptions, and directs it to others; yea it keeps it within certain limits at its pleasure, lest it Should expatiate or divert too much from the thing proposed: Which out of doubt is a sign that there is a Superior Soul in Man, that moderates and governs all the faculties and Acts of the Corporeal. But the Intellect, not only eminently Contains every Virtue of the phantasie; but from the Species perceived in it, deduces many other thoughts altogether unknown to the sense, and which the Phantasie of it self could no way Imagine. For Besides, that it conceives the formal notions of Corporeal things, abstracted from all matter, and attributes to them prædicates meerly Intentional yea and understands axioms or first principles alone, and as it were by a proper Instinct, without recourse to Corporeal Species; the humane mind also beholds it self, by a reflected Action, it supposes it self to think, and thence Knowing a proper existency, not to be perceived neither by Sense nor by Phantasie; when in the mean time, neither Sense nor Imagination (of which no Images are extant) do perceive it self to know or imagine: Besides these, the Rational Soul comprehends, as it were by its own proper light, God to be Infinite and Eternal, that he ought to be Worshipped, that Angels or Spirits do inhabit the World, Heaven, and places beneath the Earth, that there are places of Beatitude, and Punishment, and many other notions meerly Spiritual, by no means to be learnt from Sense or Phantasie.

What and how slender this is in Brutes.

The rational judges, discerns, and directs the propositions of the Phantasie.

It deduces from these others more sublime thoughts.

It beholds it self by a reflected Action.

And Contemplates other things remote from sense, as God &c.

The Ratiocination of the Brute, what and how vile!

The humane Mind immensely more excellent. Is imbued with a natural Logick.

3. The perogatives of the Rational Soul, and the differences from the other Sensitive or Corporeal, may be yet further noted, by Comparing the Acts of Judgment and Discourse, or Ratiocination, which it puts forth more perfectly, and often time demonstratively, when these Kind of Acts, from this power in the Brutes, are drawn forth imperfectly, and only analogically, we have already declared the utmost that Brutes can do, and how far they can go towards the exercise of Reasoning and Deliberation, through innate faculties, and acquired habits; which truly, if the whole be compared with the functions of the humane Intellect, and its Scientifick Habits, it will hardly seem greater than the drop of a Bucket, to the Sea. For to say nothing of that natural Logick, by which any one endued with a free and perspicacious mind, probably and sometimes most certainly concludes, Concerning all doubtfull things, or things sought after, if that we mind how much the humane mind being adorned by Learning, and having learnt the Sciences and liberal Arts, is able to work, understand, and search out; it would be thought, tho in an Humane Body, to be rather living with Gods or Angels. For indeed here may be Considered, the whole *Encyclopædia* of Circle of Arts and Sciences, which (excepting

It hath Created all Arts & Sciences (except Theologie.)

Logick,

Physick,

Metaphysicks,

Mathematicks,

Algebra,

Admirable things of Geometry and Astronomy.

The humane Mind does wonders in mechanical Things.

In respect of Man, how little is it that the Soul of a Brute can do?

That there are two distinct Souls in Man besides many other of later Time there are for Authors.

Gassendus

And Hammond.

excepting Divinity) hath been the Product or Creature of the Humane Mind, and indeed argues the Workman if not divine, at least to be a particle of Divine Breath, to wit, a Spiritual Substance, wonderfully Intelligent, Immaterial, and which therefore for the future is Immortal. It would be tedious here to rehearse the Subtil Wiles of Logick, and the extremely curious web of Notions, or of the Reason of Essences, or Beings, where the things of Natural Philosophy being unfolded by their Causes, are dissected as it were to the Life; the most pleasant Speculations, the profound Theorems or rather Celestial, of the *Metaphysicks* or supernatural things; yea and the grand Mysteries of other learning first found out by humane Industry. But above the rest, is it not truly amazing to see the most certain Demonstrations of the Mathematicks, and therefore a-Kin and greatly alluding to the Humane Mind, its Problems and Riddles how difficult soever to be extricated, with no labour, yea and many things of it attained, and most glorious Inventions. What is it below a Prodigy, that *Algebra* from one Number or Dimension, which at first was uncertain and unknown, being placed, should find out the quantity of another altogether unknown? What shall I say concerning the Proportions of a Circle, a Triangle, a Quadrangle, and other Figures, and of their Sides or Angles variously measurable among themselves, being most exactly computed? what besides, that the Humane Intellect having learnt the Precepts of *Geometrie* and *Astronomie*, takes the spaces of inaccessible places, and their heights, the floor or breadth of any superficies, and the contents of solids, yea the dimensions of the whole Earthly Globe: measures exactly the spaces of hours and days, the times of the year, the Tropicks, by the progress only of a shadow? yea it measures the Orbs, Magnitudes, and Distances of the Sun and Stars, for a long time to come, Calculates, and exactly Foretells, their risings and settings, motions, declinations, and Aspects one to another; we should want time, should we go about to enumerate the several portentous things, either of the practice or speculation in the Mathematicks. Then, if passing over to Mechanical things, We shall consider the several Works and Inventions of Workmen, and the artificial Smiths-Works wonderfully made, there will be no place for doubting, but that the humane Soul, which can so famously understand, invent, and find out, and effect, I had almost said, Create things so stupendious, must needs be far above the Brutal, Immaterial and Immortal; especially because Living Brutes obtain only a few and more simple Notions and Intentions of Acting, yea and those always of the same Kind, and not determinated but to one Thing, altogether ignorant of the Causes of things; and know not Rights or Laws of political Society: further, they make no Fires or Houses, nor find out any mechanical Arts, they put not on cloaths; nor dress their food, yea unless taught by Imitation, they know not how to number Three. When therefore we have plainly detected in Man, besides the Corporeal Soul, such as is Common with Brutes, the prints of another superiour, meerly spiritual, we shall next seek out by what bond, and by what necessity, these twins are conjoynded, and intimately come together, in the same Body.

Some of those, who have shew'd the difference, between the Souls of the Brute and of Man, affirming the Irrational or Corporeal peculiar to them, would have the Rational Soul of Man, to perform not only the Offices of the Intellect and Discourse, but also the other Offices of Sense and Life, yea to do and administer the whole Oeconomy of Nature: To which opinion (however it may have prevailed in our Schools) the opinions of most learned men of every Age has been clearly opposite. That I may not be tedious, in rehearsing of many, I shall cite only two Authors (but either of which is worth a Multitude) in the Confutation of this Assertion. One is, that famous Philosopher, *Peter Gassendus*, who *Physic. Sect. 3. lib. 9. Cap. 11.* differencing the Mind of Man, as much as he could, from that other Sensitive Power of his, by many and very remarkable notes of discrimination, yea (as 'tis said in the Schools) by Specifick Differences, he has (as they say) divided the whole Heaven between: Because when he had shewed this to be Corporeal, Extensive, and also Nascible or that may be born, and Corruptible, he saith that the other was an Incorporeal Substance, and therefore Immortal, which is Created mediately by God, and infused into the Body; which opinion he shews *Pythagoras*, *Plato*, *Aristotle*, and many ancient Philosophers, besides *Epicurus*, very much to have favoured; excepting however, that they, for as much as they not knowing the beginning of the Soul they judged Immortal, affirmed it, taken from the Soul of the world, to slide into the humane Body, and it to be refunded again either immediately into that Soul of the World, or mediately at length, after a Transmigration thorow other Bodies. The other suffrage concerning this matter is, of the most Learned Divine, our *Dr Hammond*, who unfolding that Text of St Paul to the *Thessalonians*, 1 chap. 5. v. 23. *The whole Body Soul and Spirit*: says, that man is divided into three parts, to wit, First into the body, which is the Flesh and Members:

Secondly

Secondly, Into an Animal Life, which also being Animal and Sensitive, is common to Man with the Brutes; And Thirdly, into Spirit, by which is signified the rational Soul, at first Created by God, which being also Immortal, returns to God, *Lib. Annor. on the New Testament, p. 711.* He Confirms this his Exposition, by Testimonies taken from Ethnick Authors, also from the Fathers. And truly it is most evidently plain, from what hath been said, That Man is made, as it were an Amphibious Animal, or of a middle Nature and Order, between Angels and Brutes, and doth Communicate with both, with these by the Corporeal Soul, from the Vital Blood, and heap of Animal Spirits, and with those by an intelligent, immaterial, and immortal Soul. And indeed, Reason persuades us plainly that 'tis so, to wit, for as much as we find in our selves, as by and by shall be more fully shown, the Strifes and Dissentions of one Soul with another, sometimes this, and sometimes that getting the Rule, or being in Subjection. But as it is said, That the Rational Soul doth exercise of it self all the Animal Faculties, is most improbable; because the Acts and Passions of all the Senses, and Animal Motions are Corporeal, being divided and extended to various Parts; to the performing which immediately, the incorporeal and indivisible Soul seems unable, so that it would be finite. Then as to what respects that Vulgar Opinion, that *the Sensitive Soul is subordinate to the Rational, and is as it were swallow'd up of it*, as that which in Brutes is the Soul, is mere Power in Man; these are trifles of the Schools. For how should the Sensitive Soul of Man, which subsisting at first in Act, was material and extended, foregoing its Essence at the coming of the Rational Soul, degenerate into a mere Quality? if that it should be asserted, That the Rational Soul by its coming, doth introduce also Life and Sensation, then Man doth not generate an animated Man, but only an inform Body, or a rude lump of Flesh.

This also Reason dictates.

The Rational Soul does not exercise the Animal Faculties.

Obliterates not the Sensitive Soul by its coming. Nor transmutes it into a mere Power.

Therefore, supposing that the Rational Soul, doth come to the Body first animated by another Corporeal Soul, we shall inquire, by what Bond or Knitting; since it is pure Spirit, it can be united to it, for as much as it hath not Parts, by which it might be gathered to, or cohere with this whole, or any of its Parts. Concerning this, I think we may say, with the most Learned *Gassendus*, That the Corporeal Soul is the immediate Subject of the Rational Soul, of which, as she is the Act, Perfection, Complement, and Form by her self, the Rational Soul also effects the Form, and Acts of the humane Body. But for as much, as it seems not equal nor necessary, that the whole Corporeal Soul, should be employed by the whole Rational; therefore we may affirm, this purely Spiritual, to sit as in its Throne, in the principal Part or Faculty of it, to wit, in the Imagination, made out of an handful of Animal Spirits, most highly subtil, and seated in the Middle or Marrowie part of the Brain: Because, when as the Species, or every sensible Impression, of which we are any ways Knowing, being inflicted any where on the Humane Body, is carried to the Imagination or Phantasie, and there all the Appetites or Spontaneous Conceptions, or Intentions of things to be done, are excited, the Intellect or Humane Mind, presiding in this Imperial seat, easily performs the Government of the whole Man. For (as *Gassendus* properly has it) *As there is no necessity for a King, to be in his whole Kingdom, but only in his Palace, to which place, are carried whatever happens in the Kingdom; so the Phantasie is the Kingly Palace of the Intellect, to which may be brought whatsoever are acted Spontaneously and to our Knowledge, in the whole Body.* But as to what has relation to the Functions merely Natural, which being done by a constant manner of Oeconomy, as it were by a Law from the Creator, are performed unknown to the Animal, it were not fit, that the Imagination, much less the Intellect, should attend on these lower Offices: altho' also, the faults of these, as often as they are amiss, lying hid to the Imagination, the Intellect most often finds them out, and procures them to be amended. As to the Mode of the Intellect, by which the Phantasms of all sensible Things being drawn in the Imagination, is beheld, it may be said, That this is done not by perculsion from the Corporeal Species, (for this is repugnant to the Corporeal Faculty) but by an Intuition into it self, expressed in the Phantasie. But as the Rational Soul, will stay and preside in the Court of the Phantasie, there is no need that she should be shut out from thence, or bound by any Bond; because destinated to this by the most high Creator, to wit, that it should be the informing Form of Man; and also her self is very much inclined, to the Inhabiting this House; because, whilst in the Body, it depends very much, as to its Operation, on the Phantasie, without the help of which, it can know or understand nothing. For it draws its first Species and fundamental Idæa's, by which it rears all its manner of Knowledge, from the Imagination; wherefore, that the Mind of one Man understands more, and reasoneth better, than that of another, it does not thence follow; that Rational Souls are unequal, but every disparity, concerning the Intellect, proceeds immediately from the Phantasie, but mediately and principally from the Brain, being variously disposed. For as this being affected, by an

By what Bond the Rational Soul is united to the Body.

That the Corporeal Soul is the Subject of the Rational. Gass. Physic. Sect. 3. Memb. Post l. 9. c. 11.

Gassend. Ibid.

The Seat or Palace of the Humane Mind, is in the Phantasie.

The manner by which the Phantasms are beheld by the Intellect, viz. Intuition, not Perculsion.

The Rational Soul is inclined to the Body.

The Intellect depends upon the Phantasie.

By reason of the various Constitution of this, and the Brain, Souls seem unequal.

How the Habits of Reasoning are acquired and performed.

Gassendus, *ib.*

That the Rational Soul is Created and poured into the formed Body.

Not propagated Extraduce.

Separate States.

A Plurality of Souls in Man, is manifest by their differences.

In Man a twofold Knowing Power, and a twofold Appetite.

Intemperate or Evil Conformation, the Spirits being made more dull, or hindered, cannot irradiate and actuate in their due manner; therefore the Phantasms are deficient or distorted, and the Faults or Vices of these infects the Intellect. Hence it very often happens, by reason of some hurt coming to the Brain, that the Faculties or Habits, or Ratiocination or Reasoning, howsoever strong, are diminished or taken away: Because, as the most Skillful Gassendus tell us, That the acquisition and loss of an habit, stands in the Power of the Brain and Phantasie, a subject purely Corporeal; but that the Intellect, as it wants Parts, cannot be wrought upon by Parts, but that it is from the beginning, and of its own Nature, a full and perfect power of understanding; which understands, not more by the coming of any Habit, but is rather it self an Habit, always ready to understand: wherefore he says, that Aristotle has hit the mark, when he says, that his Agent having its Intellect, as it were a Light, had it therefore as it were a certain Habit: to wit, when this Intellect, as it were a Light, is ever ready to illustrate; therefore it would have it self like to an Habit, in a Workman or Artist, to whom, when you give an Organ or Instrument, as an Harp to an Harper, he is presently ready to Play; by which it comes to pass, as he says, the Intellect also to come under such a Reason, like as Art comes under Reason, as to Master: So we may say, As an Harper has in himself the Skill of Playing on the Harp, and if he shews not his Art, there is a defect, not of himself, but by reason of the absence or the depraved disposition of the Harp; after the same manner, the Intellect is abundantly instructed, in its own Nature, that it understands, and uses Phantasies, and if it may not do it, the cause is not in it self, but is either in the absence of the Phantasms, or their Imperfection. For indeed, as the same Author afterwards adds, The chief Function of the Humane Intellect seems to be like that of the Angels, that it is of its own Nature, merely Intelligent, that is, Knowing things by a simple Sight, not by Ratiocination; But that darkness is poured on it dwelling in the Body, that it doth not perceive all that it understands, simply, nakedly, and as it were through the means of Intuition; but attains it very much by reasoning, that is, successively, and proceeding as it were by degrees.

From these we may probably Conclude, or at least Conjecture, after what manner the Rational Soul remains in the other Corporeal, and using as it were its Eyes, and other Powers, understands; yea, and this mediating or coming between, she is said to be united to the Body, and to be its informing Form. As to the first yoking of the one Soul with the other, tho the Rational Soul it self, and this, is altogether ignorant of its Birth, we may affirm notwithstanding, what is Consonant to Holy Faith, right Reason, and to the Authority of Divines, who were of the chiefest note; That this immaterial Soul, for as much as it cannot be born, as soon as all things are rightly disposed for its Reception, in the Humane formation of the Child in the Womb, it is Created immediately of God, and poured into it.

But that some have said, That the Rational Soul is propagated *Extraduce* or of its Kind, for as much as oftentimes the Son, in respect of Wit, Temperament, Ingenuity, the Affections, and other Animal Faculties, is exactly like the Father, it follows not; because these Gifts and Offices proceed immediately from the Corporeal Soul, which we grant to be begotten by the Father, together with the Body, but not the Rational Soul. In what State this at last exists, being freed from the Body, and what Kind of Understanding and Knowledge it enjoys, is not easie to be determined; but since we shall be like the Angels, we may think, that the separated Soul doth see all Objects with a Simple sight, and by no Corporeal Species, and wants no Ratiocination, for the discovering any thing lying hid in them. But this Speculation being let alone, as too airy; we shall further Consider, other Gestures and Manners of the Rational Soul, whilst it lives in the Body; and as hitherto we have seen the Marrying together of it, with the Corporeal Soul, and the mutual Commerces and Friendships as to the Knowing Faculties of either, we will now consider the Disputes and Wranglings of these, which in respect of their Powers, often happen: because the Intellect and Imagination, do not agree in so many things; but that it, and the Sensitive appetite, are wont to disagree in more: from which Strifes may further be argued, the distinct means of the aforesaid Souls, both as to their subsisting and working.

3. As there is said to be in Man a twofold Knowing Power, *viz.* The Intellect and the Imagination, so it is commonly affirmed, that there is a twofold Appetite, *viz.* The Will, which proceeding from the Intellect, is the Handmaid of the Rational Soul; and the Sensitive Appetite, which cleaving to the Imagination, is the Hand or Procuress of the Corporeal Soul. Which Opinion, tho it be founded on the Sayings of the Ancient Philosophers; for that by Plato and Aristotle, The Will is attributed to the Rational Soul, and to the Irrational Lust and Wrath; yet it ought not to be so taken, as if the Rational Soul, for that it is immaterial, and therefore esteemed without Affection, should be obnoxious to the Affections of desires or aversions, from every shaking approach of Good or Evil,

Evil, of that being turbulent; for this indeed is repugnant to its incorporeal Nature, and to its Dignity and Prerogative above other Powers. Without doubt, in the Contemplation of Truth and Goodness, and especially of that which is the sum of either, in the doing of good Works, in the Knowledge of things by their Causes, and in the Exercises of Habits, both Scientifick and Practicall, great Complacency happens to this; and on the contrary a certain displeasure for the want of these. Moreover, the Love of God, of Virtue, and of all that is good, and the detestation of Vices, and of wicked Men; yea, and other pure Affections, and such as are Simple, coming without perturbation or trouble, belong to the Rational Soul: In the mean time, *That she* (according to Plato) *like the top of Olympus, might enjoy a perpetual Serenity, hath the whole heap of Perturbations below it self, and in the irrational part, placed like Clouds, Winds, and Thunder, in an inferior Region, and under its feet.* And truly, all the vehement Affections or Perturbations of the Mind, by which it is wont to be moved, and inclined hither and thither, for the Prosecuting the Good, or shunning Evil, belong wholly to the Corporeal Soul, and are seen to obtain the same seat with the Phantasie, within the middle or marrowy part of the Brain: (by what means the Passions also affect the *Præcordia* by consent, shall be declared afterwards) in the mean time, the Intellect, even as it beholds all the Phantasms, and Orders and Ruleth them at its pleasure; so it not only perceives, but whilst it is its self, governs and moderates, all Concupiscences, and Floods of Passions, that are wont to be moved also within the Phantasie; and so, as it approves these Affections, and rejects those, now excites others, now quiets them, or directs them to their right ends, the Rational Soul it self is said to exercise certain Acts of the Will or Power, by these kind of Dictates of hers, and that she her self wills or wills not, the same thing, which by her Permission or Command, the Sensitive Appetite desires or hates.

The Rational Soul of it self without Affections; how it governs and orders the Phantasie and Affections.

But the Corporeal Soul does not so easily obey the Rational in all things, not so in things to be desired, as in things to be known: for indeed, she being nearer to the Body, and so bearing a more intimate Kindness or Affinity towards the Flesh, is tied wholly to look to its Profit and Conservation: to the Sedulous Care of which Office, it is very much allured, by various Complacences, exhibited through the Objects of every Sense: Hence she being busied about the Care of the Body, and apt by that pretext, its natural Inclination, and indulging Pleasures, most often grows deaf to Reason, perswading the contrary. Further, the lower Soul, growing weary of the yoke of the Other, if occasion serves, frees it self from its Bonds, affecting a License or Dominion; and then there may plainly be seen the Twins striving in the same Womb, or rather a Man clearly distracted or drawn several ways, by a double Army planted within himself; to wit,

In things to be Known, the Corporeal Soul obeys the Rational, but not in things to be done.

The Corporeal Soul inclining her self to the Flesh,

—Where Ensigns Ensigns meet,

And where with Arms, they one another threat;

Fights against the Rational.

This Kind of Intestine Strife, does not truly cease, till this or that Champion becoming Superior, leads the other away clearly Captive. Altho in the mean time, to the Establishing the Empire of the Rational Soul, also for the Vindicating of its Right and Principality, from the Usurpation of the Sensitive Soul, the Precepts of Philosophers, and Moral Institutes are framed; and when these can do little, Sacred Religion gives far more potent helps, whose Laws and Precepts being rightly observed, are able to carry Man, not only beyond the Brutes, but himself, to wit, above his Natural State; for as much as they subject the Sensitive Soul to the Rational, and both to the most high God. But yet, such a Divine Politie is not erected in Man, without great Contention: Because, whilst Reason using its proper force, and also Institutes and Sacred Ethicks, endeavours to draw the Faculties of the Corporeal Soul to its Party, she rising against it, adheres pertinaciously to the Flesh, and is hardly pull'd away from its Blandishments; yea, what is to be lamented, it seduces in us the Mind or Chief Soul, and snatches it away with it self, to role in the Mud of Sensual Pleasures: So that Man becomes like the Beast, or rather worse; to wit, for as much as Reason becoming Brutal, leads to all manner of Excess. But indeed, 'tis not always so with the Empire of the Mind; but that the returning at length, sometimes on her own accord, or awakened by some occasion, and knowing of its fall, arises up against the Sensitive Soul, as against an Enemy or Traitor, casting her out of her Throne, commands her to Servitude; yea, sometimes by reason of some wickedness committed, it compels it to torment it self, and its Lover the Flesh, and so to expiate as much as it may, its faults, by inflicting on it proper Punishments. Indeed, these kind of Acts and Affections of Conscience, near to Man, plainly shews, that there is in him either two Souls subordinately, or at least the Parts of the same are far different; to wit, when one of which opposes the other, and either strives for the obtaining of Profelytes, it happens that Man is hurried into contrary Endeavours, and is acted little less than like a Dæmoniack possess'd with a Legion. But

How it is reduced to Obedience.

It often seduces the Mind.

Wars are moved between them.

Affections of Conscience nigh to Man.

having propos'd these things, concerning the Rational Soul, (which we have touch'd only by the by, as besides our purpose) we will return to the Corporeal, and as we have illustrated its Essence, Hypostasis, and Integral Parts, we shall now descend to the Explaining of its Affections, or Passions.

But in the mean time, as we have shewn, by comparing the Corporeal Soul of the Brute, with the Rational of Man, what vast difference there is between them, perhaps it might be to the purpose, to compare the Brains of either, and to observe their differences. But this Anatomy being elsewhere made, we have not'd little or no difference, in the Head of either, as to the Figures and Exterior Conformations of the Parts, the Bulk only excepted; that from hence we concluded, the Soul Common to Man with the Brutes, to be only Corporeal, and immediately to use these Organs. But as we have shewn the description of a Sheeps Brain, dissected within the Cortex, and as it were made bare of Flesh, whereby all the Interior Parts might appear, we shall here also, to Crown the work, give you the Figure of an Humane Brain; so as all the inward Parts may be laid open.

The Eighth Table,

Contains a new Anatomy of the Humane Brain, where, by a Dissection with an Instrument made thorow the Bill, the Callous Body, and the Fornix or Arch, and their Parts being taken away and separated; the streaked Bodies, also the Optic and Orbicular Prominences, one side erased, and the other whole and plain, are Exhibited.

- A. A. A. A. The Hemisphear of the Brain divided and separated by themselves.
- B. B. B. B. Portions of the Callous Body with the Fornix cut off, and removed apart.
- C. The Basis of the Fornix, with its Roots, which covered with its Trunk Y Y; divided Portions of which, with Cuttings off of the Callous Body, are laid apart on the right and left hand.
- D. One streaked Body scraped or Erased, that the Medullary streakes or nervous Tracts may appear.
- E. The formost border of this Body, sticking to the right Hemisphear of the Callous Body.
- F. G. The Basis and the Cone, of the same Body.
- H. The hinder Border of the same, in which the Optick streaks, yea and other Medullary Processes, are sent from the Orbicular Prominences.
- I. The streaked Body of the left-side plain, with the Vessels creeping thorow them; whose Borders and Ends are made after the same as in the right.
- K. The right Optick Chamber erased, whose Medullary streaks, being strait and thick set, K.K. are stretch'd forth, into the Border of the streaked Body.
- L. The right Nati-form Prominence in like manner erased, with streaks stretched forth into the Medullary Process M.
- M. The Medullary Process, which proceeding from the Testes, and compassing about the Nates, sends from thence other Medullary passages into the streaked Body, as more plainly appears in the left side being whole.
- N. The Pineal Kirnel in its proper place.
- O. O. The Orbicular Prominences called Testes, Marrowy thorow the whole.
- P. The left Nati-form Prominence plain and whole, which is smaller in Man, and for the most part Marrowy.
- Q. A Medullary Process, Compassing the Nates, from which is sent one Medullary Pipe or passage R. towards the Cone of the streaked Body, and another S. towards its Basis; of which by and by a forked branch goes forth, one r. to the middle of the streaked Body, the other s. to the corner of its Basis.
- T. A Transvers shoot knitting together the aforesaid Branches.
- V. The hinder Borders of the streaked Bodies, joyned together among themselves.
- W. The Gap or Chink leading to the Tunell.
- X. The Gap or Chink, leading into the Cavity, lying under the Orbicular Prominences.
- Y. A Medullary Process, leading from the Oblong Marrow, into the Cerebel, which seems to be the root of this.
- Z. Z. Separated Portions of the Cerebel cut off, that its Tracts both Marrowy, and Cortical or Barkie, may be seen.
- X. The Cavity or hollownes lying under the Cerebel.

CHAP. VIII.

Of the Passions or Affections of the Corporeal Soul in General.

THe whole Corporeal Soul, so long as she is quiet and undisturbed, she is fitted to her proper Body equally, as to a certain Chest or Cabinet, and waters all its Parts gently, both with little Rivulets of Blood Circulating, and actuates and inspires them every where with a gentle falling down of the Animal Spirits; But it sometimes happens, that the whole Constitution of this same Soul, is so shaken and moved, that both the Blood being interrupted in its equal Circule, is compelled into irregular Excursions, and Recursions, and various Fluctuations; and also, that the Animal Spirits being snatched hither and thither, inordinately perform the Acts of their Functions: yea, the Animal Spirits themselves, whilst being moved irregularly, do shake the *Pracordia*, and flow into them in an undue manner, cause the Course of the Blood more to be perverted. Further, from the Corporeal Soul being disturbed, not only the Animal Spirits, and Rivers of the Blood, are driven into disorders, but they induce alterations both to the other Humors, and to very many Parts and Members of the Body, and to the Rational Soul it self, in Man. As there are manifold Examples of these kind of Perturbations, by which, the Corporeal Soul being too much swell'd up, or Contracted, or otherways distorted, it becomes as it were unequal, and not Conformable to the Body, the Chief of them may be referred to these two Heads. To wit, First, Sometimes this Soul, as it were leaping forth, erects and stretches out it self beyond measure, and so dilating its *Hypostasis*, desires to reach it self beyond the bound of the Body: Hence the Animal Spirits, being respectively moved, in the Brain, enlarge the Sphear of their Irradiation, and as they so shake the *Pracordia*, by a more full inflowing, they Compel the Blood therefore to be snatched together, and to be poured forth more freely into all the Parts. Secondly, Sometimes on the contrary, this Soul being struck, is more narrowly Compressed within it self; so that being drawn inwardly, and sinking down within its wonted Compass of Emanation, becomes less than the Body; wherefore, the Animal Faculties wonderfully flagg, and their Acts are either sluggishly or perversly performed: Moreover, the *Pracordia* also being destitute of their due influx of Spirits, almost sink down, and suffer the Blood to stay too long there, and to stagnate oftentimes. There are besides some other Gestures of the aforesaid Soul, by which the same departing from its equal Expansion, becomes not Congruous to the Body; and in these kind of Cases, chiefly the Sensitive Power, according to the received Impressions, affects a new Species, and brings the Brain and Imagination into its Party: Then by and by, by the passage of the Nerves, it affects the *Pracordia*, as it were with a certain stroke, and determinates them after her measure; so that according to the Idea received from the Imagination, the Motion of the Blood is Compos'd, as it were after the measures of a Dance: we shall add anon Instances and Examples of these, when we shall treat of the Passions particularly.

A Twofold State of the Corporeal Soul: Tranquil or Quiet,

And Disturbed.

In which either part of the Soul is moved.

And is either too much enlarged,

Or Contracted.

The Trouble of the Soul, impressed on the Sensitive Part, by and by is Communicated to the Blood.

In the mean time, that we may inquire into the Causes of the Passions in general, it plainly appears from what hath been said, that the Corporeal Soul is found under a twofold state, to wit, either of Quiet or Commotion: That she is like a Calm Sea, with a smooth Superficies, and squared altogether gentle and serene; or she becomes troubled, like water shaken into various Circles, and wavings by the blasts of the Winds, or by some solid things cast into it. The former state of the Soul is perceived, not only in Sleep, when the Spirits are bound up, or lye quiet of themselves; but often in Waking, to wit, as often as objects or sensible things, being brought from without, or imaginary things conceived within, do import nothing of Good or Evil to us, and that we only know and apprehend them: for so, without any Trouble or Molestation, they pleasantly slide into the common Sensory and Imagination, and thence quickly pass away; but if the object is offer'd under the Species of Good or Evil, presently the Sensitive Soul prepares for the embracing or the avoiding it; and not only procures to its Endeavors the Animal Spirits, but also the Blood and Humors; yea, draws the solid Parts to help her. For as soon as the Imagination conceives any thing that is to be embraced or shunned, presently the Appetite is formed by the Spirits inhabiting the Brain, ordered into a Series; then by an impression sent to the *Pracordia*, as they are either dilated or contracted, the Blood is carried into various Motions of Fluctuations, and then by an instinct of the Appetite transmitted to the proper Nerves, the respective Motions are drawn forth: And upon these kind of Furnitures and Affection of the Spirits and Humors, and of the solid

The quiet of the Soul happens not only in sleep, but often waking, when pleasing or unhurtful things are met with.

On the contrary when from the Objects, Good or Evil is promised:

Then first the Imagination afterwards the Appetite is moved.

solid Parts, the Affections or Passions of the Mind wholly depend, we have elsewhere shewed, after what manner, and by what Trajection or Irradiation of the Spirits, within the Nervous Processes, such quick Commerces are made, between the Brain and the *Præcordia*, and between both these and other Motive Parts.

But that we may yet more fully describe the Affections or Passions of the Corporeal Soul, as they are chiefly to be found in Man, it is here to be noted, That not every Species or Appearance of Good or Evil, does excite these Commotions of the Soul : because we behold undisturbed the prosperous or adverse things of others, not related to us : But further, 'tis requisite that the Goodness or the Malice of the Object belongs properly to a Man, altho' what happens to our Friends or Relations, is as if it happened to our selves. Also besides, Good and Evil happen to the same Man after various ways, and under a diverse reason, both in respect of the Object, and also in respect of the Subject. Concerning the former we shall speak anon : As to the other, Good or Evil being brought to Man, either respect the Corporeal Soul by it self, and as it were abstracted from any other Relation ; or they respect her as conjoined to the Body, and intimately dear to her : Or lastly, they respect her, as subdued by the Rational Soul ; so indeed, altho' the Affection is continually poured into the Corporeal Soul, yet it respects Good or Evil, either of this, or that, or of another Subject, and is excited for the sake of that : And according to this threefold Relation of the Sensitive Soul, the Passions by which she is affected, are called either Physical, or Metaphysical, or Corporeal or Moral ; we shall discourse singly, and a little more plainly of these.

First, Therefore, as to the Passions merely Physical, we say, That the *Sympathies* and *Antipathies* of a diverse Kind, which are as it were proper and intimate Affections, seem to belong to the Corporeal Soul by it self, and abstracted from all Relation : Besides, the highly attractive Species of Beauty and Fairness, by the sight of which this Soul is wont to be insnared, most certainly ; so that neglecting the Care of the Body, and laying aside the dictates of Reason, cleaves most closely to her Lover : Also sometimes less fair things which every whole Man would forsake, snatches this Soul, drawn as it were by Witchcraft, and leads it Captive ; as indeed, lost Lovers, though they see better things and approve them, yet follow the worse ; the reason of which is, that the Sensitive Soul enters into Friendships, of which the Affections are not knowing, with certain things in Secret, and inseparably and firmly loves them. Concerning *Antipathies* we meet with many things to be admired, as some sensible Objects, innocent of themselves, yea and grateful enough to many Men, and sought with delight, become most horrid to some others, and more Killing than the Head of *Medusa* at the sight only : So some abhor the presence of a Cat, others an Eel, or Toad, and others this or that Dish of meat made ready. Nor do they only fly things by the sight, but also received by the smell, yea, when they lye hid, and are not at all suspected, they suffer Swoonings and Fainting of their Spirits, by their secret Influence : These Kind of Affections without doubt, proceed from occult Enmities of the Sensitive Soul ; for when it happens this *Systasis* or Disposition of the Animal Spirits, by the meeting of some Object, to be driven into Confusion, it ever after that abhors the coming of the same, or its Contact by its Effluvia's.

Secondly, Sometimes the Sensitive Soul receives the Superior Rational Passions, which we call *Metaphysical* ; and solicitously busying it self concerning their Good and Evil, it either draws forth or shortens the Compass of its Expansion. For indeed, the Rational Soul relying on the help and familiarity of the Spirits dwelling in the Brain, aspires to Metaphysical Notions, which having more fully learnt, it not only falls upon higher Speculations, but also exerts a certain Superior Appetite, to wit, the Will, and implicates it with certain Affections, as it were inspired of God ; the exercise of which sort of Sacred Affections are not performed by the mere Conceptions of the Mind : But their Acts being delivered from the Rational Soul into the Sensitive, do first employ the Brain with the Phantasie, then being transmitted from the Brain into the Breast, there, for that they produce in the Heart and Blood variety of Motions, receive their Complement or Perfection : Wherefore, in the Worship of God, Piety and Devotion are attributed very much to the Heart : Hence Repentance, the Love of God, and Hate of Sin, Hope of Salvation, Fear of Divine Vengeance, and many other acts of Religion, are wont to be ascribed to the work and endeavour of the Heart. The reason of which seems to be, for as much as the whole Corporeal Soul is Commanded by the Rational Power ; that in Adoring God, she should very much bow her self before the Deity, and as it were lye prostrate on the Ground ; therefore, presently both Parts of it, viz. both the Sensitive and Flamy, do repress themselves, and restrain their wonted Emanations ; hence plenty of Animal Spirits being drawn from the Phantasie, for the more full actuating the Organs of the Senses, they bestow the Operations of the Nerves on the *Præcordia*, which

The Reason of Good and of Evil, either concerns,

The Corporeal Soul by it self. Or her united to the Body, Or her subjected to the Rational Soul.

Hence Passions are called either Physical, Metaphysical, or Corporeal.

Passions merely Physical, are Sympathies and Antipathies.

Some Instances of Passions merely Physical.

Passions Metaphysical.

By these first the Rational Soul.

Then the Sensitive and Sanguineous part of the other are affected.

which whilst they are more straitly drawn together, and as it were constrain'd, cause the Blood to stay longer within the bosomes of the Heart; and so inhibit it, lest it should be too much inkindled within the Lungs, and lest being inkindled by the Heart, in the whole Body, and chiefly should be carried rapidly into the Brain: For indeed, the Blood containing Life as a most precious Jewel in it self, is not only heaped up more plentifully about the *Præcordia*, in all Fear and Danger, and is there lay'd up as it were for defence sake, that it might better preserve its Flame: But further, in devout Affections, whilst the Rational Soul orders the Spirits inhabiting the Brain into sacred Conceptions and No-tions; by the Influence of the same Spirits, the Bosomes of the Heart are also so affected, that they cause the Blood to Centre, and to be more fully drawn into them, and there longer retain it, as it were an *Holocaust* to be offered to God: so as often as we Pray most earnestly, we endeavour nothing less, than that our Life with the Blood, be laid upon the Altar of the Heart. For truly, almost every body experiences in himself that in strong Prayer, the Blood is more and more heaped up in the Bosomes of the swelling Heart: wherefore, that the Vacuities of the Lungs might be supplied, we breath deeply, and so the Air being more fully drawn in, the Muscles of the Breast, and the *Diaphragma*, are detained almost in a continual *Systole*, or more often iterated; to wit, for this end, that the Vital Blood, to be offered as it were a Sacrifice to God, should be there kept, nor suffer'd to go from thence, or to be enlarged, till as it were by a long im-molation, together with Prayers, lieve may be had from the Godhead. Yea, 'tis to be observed, that those religiously affected, are apt at all times to call back the Blood to-wards the *Præcordia*, and to repress it from a more plentiful Excursion, which may give a loose to Delights or Mirth: Because 'tis just, that this Vital Humor should be Conserved, even Holy and Pure for God; and as it is so restrained in the *Præcordia*, lest it should grow too luxurious, nor be carried towards the Brain with too impetuous a Rapture, the Conceptions also of the Mind, without much heat and distraction of thoughts con-cerning Divine things: Hence it is, that Drinking of Wine, Banqueting, and every Kind of Dissolute Life, because they render the Blood lawless, and not able to be re-strain'd or bridl'd, are said to make hard the Heart, and to obstruct the Duties of Reli-gion. Further, not only the devout Acts of Religion, and Pious Affections, are attri-buted to the Breast and *Præcordia*; but also the sober Counsels of Wise men, yea, and the Exercises of Virtues and Moral Habits, are ordinarily ascribed by Philosophers to this Seat or Subject: Hence Wise men are said to be *Cordati*, Hearty, or sage of Heart; but when one that is unwise or plainly foolish, doth a thing, it is said, That there is nothing leaps in the left part of his Breast: The reason of which seems to be, that when as the Animal Spirits (which are the immediate Instruments of thoughts) are procreated alto-gether from the Blood, not only their more excellent disposition, but their right and timely Dispensation, depends chiefly on the *Præcordia*. For to these are owing, that the Blood be inkindled in its due manner, and also Eventilated, that it may give to the Brain firm and stable Animal Spirits, which however Subtil and Active, yet may not be vola-tile beyond measure; and hence the Solidity of the Mind, and the sharpness of Judgment are produced: When on the contrary, by reason of the Blood more slowly passing thro-rough the *Præcordia*, or more swiftly than it should do, the Animal Spirits become too fixed, or volatile above measure, and therefore either a stupidity or lightness of Mind arises. But in truth, Wisdom is much rather ascribed to the Heart, for as much as from thence reins are put upon the Blood, apt for fiercenesses and Impetuosities, lest that rush-ing into the Brain, with an inordinate rapture, should not only disturb its serious Co-gitations, but stir up enormous Motions of the Appetite, and mad Lusts. For truly, whilst the Spirits inhabiting the Brain, are disposed by the Intellect, from thence pre-siding within the Imagination, into Series and Orders of Notions, the Blood about to break forth from the Heart, ought very much to be restrained, lest that growing luxu-rious, it should confound all things by an importune evasion of the Brain, and should agitate the Spirits, called away from this work into Commotions, and various Fluctua-tions; wherefore, from the immoderate drinking of Wine, for as much as by it the Blood is made more head-strong, and will not be repressed or contained by the Heart, Men become not only unable for Exercising the Acts of Judgment and Reason; but are found very prone to all manner of Wickedness and most filthy Desires.

Wherefore, and how the *Præcordia* are esteem'd the seat of Holy Affections.

What it is to have the Heart hardened.

Wherefore the *Præcordia* are call'd also the seat of Prudence and Wisdom.

As to the Moral Passions, or by us called Corporeal, we may observe, that the Sensi-tive Soul is more often and easilier affected, by reason of Good or Evil, which is of its Subject, that is of its Body, which includes its good Habit. Altho also, she hath her proper and occult Loves and Aversations, and is bound to shew due obsequiousness to the Rational Soul; for as much as it is united to the Body, as it were by a Conjugal Compact; therefore, all other relations being lay'd aside, it minds only this; Con-cerning the Care of it 'tis mostly solicitous, and by reason of its prosperous or adverse Affairs,

Three Corporeal or Moral Passions.

Affairs, it is wont to be affected with Pleasure or Grief, and other Passions depending on either of these.

For indeed (as we mentioned before) there are two Chief and Primary Gestures of the Sensitive Soul, as often as it is moved from its wonted and Natural State or Condition; to wit, either she stretches forth her self into a greater Compass, by profuse Pleasure, as if it affected to be dilated beyond the bounds of the Body: or being overthrown by Sorrow or Grief, she is contracted more narrowly, and runs her self within the wonted Sphear of her Emanations: from this twofold Affection of the Sensitive Soul, all the other Passions take their Origine. For truly Pleasure, or an Elation of the Soul, is its most pleasing Constitution, which desiring to gain for it self by any means, it follows all Objects promising it, with Love, Desire, Hope, Faithfulness, Boldness, and other means of getting it; On the contrary, Sadness or a Contraction or Dejection of this Soul, is a Gesture most ungrateful to it; what things then soever threaten or induce it, we endeavour to remove away far, by Fear, Hatred, Anger, Desperation, Shame, Pusillanimity, and other motions of shunning it. In the first place therefore, we will speak briefly of Pleasure and Grief, which are according to *Aristotle*, as it were a forked measure of the Sensitive Appetite, for the double Ladder of Affections, flowing thence, by which she is carried to this or that.

The two Primary Gestures or Affections of the Soul, are Pleasure and Grief.

They affect the two Roots of the Soul, to wit, the Brain and the *Pracordia*.

First, Pleasure and Grief, because they bend or incline the whole Corporeal Soul after a diverse manner; therefore its two roots, to wit, the Brain and *Pracordia*, are chiefly affected. When the Soul is stretched forth in Pleasure, and is drawn to its utmost Sphear of Irradiation, the Animal Spirits being carried within the Brain, stir up most pleasant and pleasing Imaginations; and further, they actuating lively the Nervous System, Cause the Eyes, Face, Hands, and all the Members to shine, and as it were leap forth; Further, then more fully shaking also the *Pracordia*, by the Influence of the Brain, delivered by means of the Nerves, they thrust forth the Blood more rapidly, and as a Flame more brightly inkindled; they pour it forth with strength thorow the whole Body. On the contrary in Grief, whil'st the Soul sinks down, contracted into a more narrow space, the Spirits inhabiting the Brain, as it were struck down by flight, and troubled, put on only sad and fearful Imaginations, from whence the Countenance is cast down, the Limbs grow feeble, and the *Pracordia* being contracted or bound together, by reason of the Nerves carrying the same affection from the Brain, restrain the Blood from its due Exursion, which being therefore heaped up in the same place, with a weight, brings in a troublesome oppression of the Heart, and in the mean time, the Exterior Parts being deprived of its wonted afflux, languish and Contract a paleness.

Grief and Pleasure first of all arise from the Sense.

The aforesaid Affections of Pleasure and Sadness, which is wont, the Imagination being employed, to be poured from thence on the *Pracordia*, and by and by from that double Root into the whole Corporeal Soul; as to their first Originals, wholly depend upon the Sense. For from the beginning, Sensible Objects affect the Sensory with a certain sweetness or asperity, and there bring to the Spirits a certain Ovation or Triumph, or Confusion: from whence presently the Impression, like a waving of Waters, being Communicated to the Brain, excites the Spirits inhabiting it, into a consent either of the delight or trouble; and this Affection, being delivered from the Sensory to the Imagination, if it be short, there ends, and is not carried to the *Pracordia*: but if the stroke, being carried from the Sensible Object, is, like a more strong waving of Waters, impressed more vehemently, it reaches from the Sensory to the Brain, and presently thence to the Breast, that the Motions of the Heart and Blood, are intangled together with the disorder of the Animal Spirits, so as to the first Conceptions of the Affections, as well as Notions, there is nothing in the Imagination, or I may rather say, there is nothing in the Brain or Heart, that was not first in the Sense: But afterwards, when many Idea's of Pleasures and Grievs, are impressed on the Phantasie and Memory; then very often without any previous Sense, or feeling of Pleasure or Sadness, the Imagination being repeated, is wont to excite a Passion of the pleasant or troublesome thing; for when at any time we conceive in our Mind Good or Evil things belonging to us, not only present, but also past, or to come, that Conception employs the Phantasie, and not rarely very much exercises it: Further, being thence transmitted to the Breast, it inordinately either Contracts or Dilates the Breast, and so pours forth the Affection, together with the disturbed Blood, on the whole Body. A Wise and Strong man easily moderates the passions of Pleasure or Grief, lest these being brought, either from the Sensories, or suggested from the Memory, should affect the Phantasie and the *Pracordia*, by too great a waving; For the Brain and Heart, which are the supports of the Soul, ought not to be moved much, by the more light Objects of the Senses; nor are these principal Powers, at leisure to be present at every small thing: Hence some have born the torture of the Body, or the cutting off a Member, beyond Stoical Patience, undisturbed; whil'st others (in whom the sensible

Afterwards, both from this, and also from the Phantasie, and Memory.

Some are more Pathetical, or moved than others.

sensible Species, being above measure increased, vehemently shakes the *Præcordia* the Skin scarce wounded, swoon away, or fall into fainting Fits. In like manner it is observed, that some are carried away by a most light Pleasure of the Senses into softness and Luxury, in the mean time others are scarce moved with any Pomp of Delights, or Exquisite Blandishments of Pleasures. It is observ'd in the fruition of a pleasing Object (which also holds of the appulse of a pleasant, or a painful sensible thing) there happens a certain reciprocation, between the Spirits of the Brain, and the Inhabitants of the Sensory. We imagine the Drinking of excellent Wine, with a certain Pleasure, then we indulge it; the Imagination of its Pleasure is again sharpened by the taste, and then by a reflected Appetite drinking is repeated: So as it were in a Circle, the Throat or Appetite provokes the Sensation, and the Sensation causes the Appetite to be sharpened, and iterated; this Kind of mutual reciprocation of the Animal Spirits from the Brain to the Sensory, and on the contrary, persists for some time, till the same, like a waving of Water, either leisurely vanishes, or is obliterated, by the exciting of a new waving: So indeed, Passions and Desires wear out themselves, or are consumed by time, or they are blotted out by the coming of some other Passion. When the Animal Spirits, desiring too much a sensible Delight, do often, and for a long time iterate and intend the Appetite, and Act of the pleasurable Sensation, there is need of Reason to come between, whereby they being changed into Sacred and Moral Meditations, may be called away from their Carnal Genius; which Avocation however, they obey not but difficultly and unwillingly; for as much as to be expanded, and to enjoy pleasing Objects, is the Recreation and Food of the Spirits; and to be restrained or kept in, and very much to be employed about the works of the Mind, is to them a Labour, and a difficult task.

How the Affections are wont to be iterated, also how allayed or obliterated.

CHAP. IX.

Of the Passions Particularly.

Concerning the Number of the Passions, as it hath been variously disputed among Philosophers, so in famous Schools, this Division into Eleven Passions, long since grew of use; to wit, the Sensitive Appetite is distinguished into Concupiscible and Irascible, to the first, are counted commonly six Passions, *viz.* Pleasure and Grief, Desire and Aversion, Love and Hatred; but to the latter five, *viz.* Anger, Boldness, Fear, Hope, and Desperation, are wont to be attributed: But this distribution of the Affections is not only incongruous, for that Hope is but ill referred to the Irascible Appetite, and Hatred and Aversion, seem rather to belong to this, than to the Concupiscible: But it is also very insufficient, because some more noted Affections, as Shame, Pity, Emulation, Envy, and many others, are wholly omitted: Wherefore, the Ancient Philosophers did determinate the Primary to a certain Number, then they placed under their several Kinds, very many indefinite Species. Truly the Sensitive Soul, like a *Protem*, is wont to be so diversly disturbed and altered, into manifold Kinds, with the various Fluctuation, and divers sorts of Inclination of the Animal Spirits, Blood, and other Humors; that a sense or view of all the Passions, can scarce be had; But however, that these, if not all, at least the chief of them, may be in some measure discovered; we will here ordain Pleasure and Grief for the extremes, or the opposite bounds of the Inclinations of the Corporeal Soul, then we will consider, after what manner, the Objects belonging to either, by what means soever may be applied, and what sorts of Impressions they are wont to fix on the Spirits, Blood, and solid Parts. The Corporeal Soul therefore, affecting Pleasure as the greatest height of its felicity, which it would acquiesce, is moved at the appearance of any Good: if it be to come, and contrary to opinion, by and by for the getting it, Desire or Love arises; if with Opinion, Hope and Boldness; if Opinion esteems Fruition hopeless, Desperation is raised up; if this Good be past, or should be lost by our default, Shamefacedness or Repentance is brought in; if it be possessed by others, Emulation, and Envy; Love is busied about it being taken absolute, without respect to time or possession. Besides also there are other respects and habitudes of appearing Good, able to excite many other Affections with ease. In like manner on the contrary side, Grief or Trouble, is a Sickness of the Sensitive Soul, and a Disposition very much in- grateful to it; wherefore, at all the Objects apparently threatening its Induction, the Soul

The Number of the Passions uncertain.

Pleasure and Grief, what Affections are subordinate to it.

Love, Hope, Boldness, &c.

Grief with the Affections subordinate to it.

variously Contracts her self, and is inclined hither and thither, that she might shun the approaches of the threatening Evils: wherefore there are so many Affections respecting Grief, and Subordinate to it, as there are means by which the Sensitive Soul, or the Disposition of the Spirits, composes her self for the shaking off or the shunning of any Evil. Hatred is busied about Evil taken absolutely; that being absent, we prosecute with Aversion, by and by about to come with Fear; and unworthily brought, with Anger; falling upon our selves, we sustain it with sadness; inflicted on our Friends, with Pity. There are besides, many other Appearances of approaching Evil; for the shunning of which, the Soul is compelled into many Metamorphoses, and at the same time draws into the like Gestures, as it were Mimical, the Humors and Members of the Body, and oftentimes the Rational Soul it self: As it would be a business very tedious, and of immense Labour, to rehearse all the Kinds of Passions, and to unfold them, we have designed therefore to speak only of the Chief Species of the Passions, with their manner of affecting, in respect both of the Body, and also of the Superior Soul.

Love and Hate follow next, and as it were at the back of Pleasure and Grief: because the Sensitive Soul, being greatly prone, as hath been said, to Pleasure, Prosecutes all things apparently Good, without respect to Circumstances, with an Universal and most ample Affection of Love; in like manner, shunning Grief or Trouble; it hates and detests all things apparently Evil, which may seem to induce Evil by any manner of way.

The Good exciting Love, is objected after a twofold manner; to wit, either to the Sense, or the Opinion: As to the first, Objects which consist of Particles Congruous and Curiously fitted to the Sensory, so that they stroke gently the Spirits there flowing, and cause them to run and to rejoyce together, these bring forth a desirable Sensation, whose Impression being transmitted, by the passage of the Nervous Processes to the Brain, by pleasing there in like manner the Spirits, stirs them up into a pleasant apprehension of the sensible thing, and a desire of it: Hence these Spirits inhabiting the Brain, for the fruition of this Object, try several or manifold Endeavours, viz. Some being reflected towards the Sensory, desire to cleave more closely, and to be united to this Good: in the mean time, others flowing towards the Breast, sometimes dilate and open the Bosoms of the Heart, that they may more plentifully receive the Blood, imbued with a certain Virtue of the Object, and enjoy it; and sometimes the Spirits draw together these receptacles of the Heart, and drive outwardly the Blood, as if about to seek something more largely of Good, from the Object, with which being filled at last, it is received by the heart, by and by dilated. Further, in this Affection of Love, concerning the sensible Object, if that it be very strong, the whole Sensitive Soul, or the whole *Systasis* of the Spirits is inclined towards the beloved thing, lifts up to it the whole Nervous System, and together with the solid Parts, draws, and leads the Humours; so, when we are indulged with a fair Aspect or Melody, the whole Soul seems to go out at the Eye or the Ear, and neglecting the other Sensories, Conspire with their proper Offices into those Acts of Sensation.

It is somewhat otherways in Love excited through Opinion, because in this, the Species of the Object being represented by the Imagination, is erected as an Idol in the Brain; about this many Spirits being employed, at first they weigh the noted Beauty, and its various Ornaments, then they worship it; for whatsoever we love, we imagine it fair, profitable, pleasant, and far above what in truth it is; then by reason of these kind of feigned Attributes, we more earnestly fall in love with the thing beloved; Further, the Spirits inhabiting the Brain, invite all the rest, flowing in the whole Nervous Stock, to the worship of the Idol erected by themselves: wherefore the Inhabitants of every Sensory, watching for the works of the Senses, look hither; here also they wait for the Motions, Executors of the Limbs and Members; but they chiefly inspire the *Præcordia* with the Love of this Imaginary Good; wherefore, these being variously dilated, and thrust together, greedily receive, sometimes the Blood imbued as it were with the Character of the thing loved, and as it were imbibe its Influence; sometimes they cast forth that Humor from themselves, towards the Brain, as it were to pick out something from the Image of the Good: This Kind of Image exciting Love, is impressed on the Imagination, either from the Intellect, or from the Memory and Phantasia, to wit, one of them only, or both together; and from thence a Passion of Love is brought in, either Metaphysical, or merely Sensitive, or mixt.

Much after the same manner as we have said of Love, the evil Appearances also, which excite Hatred or the Aversion of the Soul, are objected to the Sense or Imagination: As to the former, when any incongruous and improporionate Object, is brought to any Sensory, that distracts and drives the Animal Spirits into a certain Confusion; therefore afterwards, when such an Object comes again to the same Sensory, the Spirits mind-

Hatred, Aversion, Fear, &c.

Next to Pleasure and Grief, are Love and Hatred.

The Objects of these, are Sensible or Imaginary things.

By what means desirable things affect the Spirits, and the Blood.

A Pleasant Sensation is described.

Love is excited by Opinion.

The Object of this, is set up like an Idol, in the Phantasia.

And worshipped.

Hatred excited, by the Sensible or Imaginary Species.

ful of their former hurt, abhor the Contact and approach of this Evil, Contract as much as they can the Organ, and shut up the Passages and Doors; if they are strong they endeavour to remove the Enemy from themselves, by sudden and iterated Excur-
How the first of these Affects the Spirits and Blood.
 sions; but if they are not able for such Assaults, they convey and hide themselves within, and reject the embraces of the hateful thing, by every manner of way. A rejection of the sensible Object happens, when stinking Odors of very unsavoury Meat strike the Pa-
 late, or Nostrils; and the like when incongruous things are offer'd to the sight, or hear-
 ing: But especially, when the breaking of the Unity happens to be inflicted by Fire, or a Sword, on the Skin or Flesh. Concerning these repulses of the approaching Object, not only the Spirits flowing in the Sensory, but oftentimes also by the consent of these; others inhabiting the Brain, are irritated into Fury; so that the Imagination conceives a detestation of the thing; and the *Præcordia* being therefore disturbed; sometimes draws back the Blood, sometimes drives it outward towards the driving away the Evil, and stirs it up to its Expulsion.

When an Object apparently Evil, appears therefore hateful to the Imagination, pre-
The Imaginary Evil affects both the Blood, and Spirits.
 sently the Phantasie fixes on it a Monstrous and very deformed Image; then stirs up all the Spirits, implanted both in the Brain and the Nervous Appendix, into a Detestation of this Imaginary Spectre, from hence the Brows are contracted, the Teeth gnash to-
 gether, and the Face is writhed; but especially the *Præcordia*, variously open and shut themselves, that they might Eventilate the Blood, by driving in up and down, and Conserve it free from every Influence or Tincture of this Object.

After this manner, the Passions of Love and Hatred are employed about Good and Evil, taken absolutely, and almost Indifferently; or rather about their Idea's: to wit, the Sensitive Soul, beholding the Image of appearing Good, received from the Sense or the Imagination, and admitting it into it self, presently she embraces it with a certain strictness, as it were with open and infolded Arms, and endeavours to be intimately united to it: But it rests not long in this fruition; for if this Image of Good be only
Love and Hate, are transitory Passions.
 Imaginary, and being embraced, vanishes like a Cloud, taken for *Juno*, the Soul, sensi-
 ble of her Error, quickly lets go her empty Embraces: yea, if that Good were solid, after some time, its fruition brings forth a loathing, and the Complacency of the Ob-
 ject at first amiable, grows cold, by the enjoyment; and it is esteemed troublesome. For indeed it is so order'd, that we esteem nothing long in this Life, but being always wanting, whatsoever is obtain'd, we esteem less, seeking after new things; wherefore, we are perpetually incited to the desiring of absent Good, and to the flying from Evils hanging over us. Love or lasting Charity, is a Divine Passion, almost proper only to
Quickly changed into Desire, and Aversion.
 Heaven, as Hatred, standing and endless, is an Affection merely Diabolical, and ought to be esteemed peculiar to Hell. But in most Mortals, these are presently changed into Desires or Aversions; because the desire of any absent Good, which we seem to want, or the declining of any approaching Evil, obliterate the Idea of any Good or Evil be-
 fore affixed to the Sensitive Soul, and adhering to it; even as the following waves sup-
 up the former.

In truth the Sensitive Soul is chiefly employed with Desires and Aversions; these are
The Soul is chiefly employed by these.
 perpetually suggested by heaps from our wants, either true or imaginary, and a very infinite Company or Succession of them exist. Concerning our Indigencies, from which
Both proceed, either from the Sense, or Op-
nion.
 these Passions are drawn, it is to be observed, that they proceed either from the Sense, or from Opinion, and so peculiar Desires or Aversions are excited: As to the former, the Animal Spirits in every Sensory, watch as so many hungry Guests expecting the Ap-
 proach of an Object congruous to them, as it were food; to the meeting and snatching
The desire of a sensible thing, is excited, either from Natural Instinct, or from Custom.
 of which, they are often wont to go as it were to meet it, and be carried quite beyond the Confines of their Subject. But that the Spirits residing in the Organ of every of the
The former is moderate, and easily satisfied.
 Senses, do greedily Covet after this manner the sensible Object, as their Prey, happens by the mere Instinct of Nature, or is procured by Custom: The former is discerned, when hunger or thirst require the Supplies of Meat and Drink; and when the Coldness
 of a naked Body requires Cloathing: These sort of Desires, which Necessity puts upon
 Nature, are easily satisfied, and what are sufficient for the maintaining of Life, and ob-
 tained after this manner; to wit, the Animal Spirits labouring under a defect, in this or
 that part, do variously Contract, and so affect with a sense of trouble the Nervous
 Bodies, in which they flow, which Impression being presently Communicated to the
 Brain, it stirs up the Spirits inhabiting it into an Appetite or Desire, and then an in-
 flowing being made into the appropriate Nerves; into a Prosecution of the desired
 thing; all this is performed without the Image of the Object, increased by the
 Imagination, also without any Perturbation known in the *Præcordia*, or the
 Blood.

Desire got through Custom, despising moderate things aspires to new things.

The reason declared, Because the Agent and Patient ought to be unlike.

The Desires of sensible things, tend chiefly to Luxury or Lust.

Phantastic Desires are immense.

But are chiefly carried to Riches or Honors.

Aversion is excited either from the Sense, or from Opinion.

This Passion being frail, is soon changed into Desire.

Sensible Desire affects both the Spirits and the Blood.

It is much otherwise concerning sensible Desires got by Custom; for when as a Fruition once happens to the Spirits inhabiting this or that Sensory, of a more pleasant Object, having moderate things in Contempt, afterwards desire the same, and being not long Content therewith, still aspire to others more pleasant; so the Palate being accustomed to more delicate Victuals, loaths every thing unless spiced Aliments, and compared with most exquisite Sawce: In like manner may be observed, concerning the Smelling, Sight, Hearing, and other Sensitive Functions; to wit, that the Appetite, proper to any of them, (for as much as it once exceeded what sufficed Nature) is always carried to more excellent Objects, and they for the most part only fresh; the reason of this seems to be, that the chief Pleasure of the Sensitive Soul, consists in a more lively Motion, and larger Expansion of the Spirits implanted in every part; but such a Motion of them, depends very much upon the Excellency, also the Variety, and Change of the Objects. For whatsoever moderate or too familiar thing happens to the Spirits, it little affects them; for every motion supposes a Superior, and a Virtue of the Object, somewhat unlike to the Agent; wherefore, when any Object by daily use obtains a Similitude, or Equality with the Spirits, that is less apt to move them: therefore that the Activity, or the lively unfolding of the Spirits (which is the Effectress of Pleasure) may be continued a long time, leaving the Fruition of every old and worn-out Good, it always tends to new and more high things: After this manner, tho every Organ of Sense puts forth Desires, peculiar and proper to themselves, it reiterates them with a perpetual change; but for as much as Objects applied through Corporeal Contact, rather than by Effluvia, affect more vehemently the Sensory; therefore the greatest Company of Desires, arising from the Sense, are wont to be referred to Luxury, or Lust: The Desires of the Spirits dwelling in the other Sensories, for as much as they take only the Species, or the little Bodies, falling off from sensible things, and less thick Embraces; therefore they are more temperate, and are often directed to better uses.

But our wants are chiefly Imaginary, and proceed from Opinion, and from hence a most plentiful Crop of Desires grows up. For indeed, every Man breaths after Felicity, or after a certain Divine State; wherefore, it seeks very much things apparently Good, which are said to Conduce to this State, and endeavours to obtain them; But having followed certain Goods, it finds not the desired Satisfaction in them; therefore it seems to want others, and then again others. So, for as much as Men always tend to the highest Good, or last end, and that he attains it not in his life-time, there is a Necessity of infinite Wishes, and Desires concerning the intermediate Goods: Hence it is, that whatsoever another has, yea, whatsoever of Good the Phantasie can conceive or feign, presently we believe we have need of it, and therefore we desire it, and wish for it. So, though there is an immense Company of Concupiscible things, yet as most Men place their felicity in Riches or Honours, hence the Chief Species of Desires arising from Opinion; and therefore not to be satisfied, are Covetousness and Ambition.

As to Aversion, this Passion seems only to be the former inverted, and in like manner, to take its Original, either from a certain Defect, perceived by the Sense, or taken from Opinion; for a Sense or Opinion of want, calls to either, a declination of the same manner of State: Wherefore, when the Animal Spirits in the Sensories, are deprived of the Enjoyment of a necessary Good, or of what they were before accustomed to, they either conceive, or set before them the approach of its Contrary, and these being very inquiet, let go the Embraces of every present Object, and set themselves to perform, or enter into a new Confederation; until either the Sense or the Opinion, shall detect some apparent Good, to the desire and following of which, the same Spirits are busied; And so Aversion, being for the most part a Passion of it self Vain, and quickly perishable, terminates in the desire of Good, that may supply the Defect so Carefully shun'd.

Having shown after this manner for what Causes, and upon what Preparations or fore Occasions, the Sensitive Soul enters into Passions of Desire and Aversion: Let us now see after what manner or ways of Gesticulations or Gestures, she is Composed in either Affection. As to Desires begun from the Organs of the Senses, it is observed, that whil'st the Spirits there implanted, are carried towards the absent Object, all fruition being left, they, as it were naked and destitute of all helps, like Beggars ask an Alms, which as they most greedily desire, as it were about to take by force that Good, they exceed the limits of their Subject; and oftentimes, when the Desire is vehement, almost the whole Soul is drawn into Parties, and by a certain going out from the Body, wanders towards the desired thing, or at least emits a Portion of it self. That it is so, it plainly appears, in that mad affection of Lust, in which the genital Humor, containing Fragments picked from the whole Soul is poured forth. In like manner, in a

pleasant

pleasant Sight, Sweet Odor, and most pleasing Harmony, the Animal Spirits, as it were lifted up, role together out of the Sensories towards their Objects: but on the contrary in Aversion, they betake themselves inward, and sometimes forsake the Sensories themselves.

As to desires excited by reason of the Opinion of want, the Sensitive Soul being impatient of a Liot so poor, becomes very instable and unquiet, all the acquired Goods of its Body, it neglects and disesteems; also refuses to hearken to the dictates of Reason; yea being altogether precipitate in desires, she always looks outward, and as it were with wings is ready to fly to this or that apparent Good; hence, by the disorder of the Spirits, flying hither and thither the Nervous Parts are variously distracted, and Men betray their desires by their Countenance, and going; also the Breast and the *Præcordia* being moved together, the Blood, like the Sea working with the winds, is compelled into various Fluctuations, that those affected sometimes grow Pale, and sometimes are overspread with redness; also, from the same Blood, entering inequally and impetuously the Confines of the Brain, succeed inconstancy of Judgment, and frequent Changes of a thing proposed; as sometimes they will do this, anon that, as if ten Minds were together by the Ears in one Man.

What Alterations Imaginary Desire brings upon them.

The Fluctuation of the Minds.

Plant. Hope and Fear.

According to the aforesaid Characters or Schemes, the Sensitive Soul is composed, about absent Good and Evil, and not quickly about to come; but when these seem to be at the Doors, the Soul alters her Position, and is respectively urged with Hope or Fear: Concerning which, First it is observed, that these Passions do not as the forementioned proceed equally from the Sense and the Imagination, but are founded only on Opinion; from whence, after entering into the desire of any thing, the Spirits being solicitous concerning the following of it, and as it were depressed, when they upon some other Occasion, as the Drinking of Wine, are a little elevated with the fruition of another pleasing Object, and they begin to strengthen Opinion, forthwith doubtful desire is changed into a certain Confidence, that we hope shortly to possess the desired Good: In like manner, when as Aversion beholds the absent Evil a long way off, the depression of the Spirits places it near, and by and by Causes a fear of its being about to come upon them. Indeed, Hope and Fear, are very near of Kin to Desire and Aversion, and either of these Symbolical Affections, denote only the more near, or more remote approach of the same Object.

Succeed to Desire, and Aversion.

As to what appertains to the Provision and Exercise of Hope, when we desire greatly any absent Good, and that an Opinion arises, that we shall shortly obtain it, presently the Animal Spirits, who first like Soldiers sent before, carefully seek after, and observe the willed thing; forthwith returning towards the Soul, bring News of the Coming of its Guest, and prepare a Reception for it; wherefore the whole Soul is presently brought into an Expectation of its coming; all the Doors of the Senses are opened, that this Good, with all its Train, might enter thorow open Gates: In the mean time, the Spirits inhabiting every Sensory, are prepared to go forth to salute this approaching; the Imagination doth forestall its Entrance; to wit, this frames an Idea of the wish'd for and coming Good, which it places within its Borders, as in a Throne, and confers on it Adornments and Splendor, borrowed from the Phantasie. Moreover, the *Præcordia* are Careful for a part of its Reception; for they being actuated with a more full Influx of Spirits, send forth the Blood more lively into the Exterior Parts, as it were for the meeting of this new Guest; hence, any one being full of Hope, feels in his whole Body, a certain Inflation, with the Spirit and Heat plentifully poured forth: Then, if by any accident, an occasion of fear or doubting is brought in, presently a sudden girding together in the whole, with a certain putting down of the Spirits, and a sinking of the whole Soul, ensues.

The Provision of Hope.

Its Object, both the Sense, and the Imagination.

Affects both the Spirits and the Blood.

For in the Passion of Fear, the Sensitive Soul being first stretched out, being struck by the nearness of the approaching Evil, and being as it were prickt on every side, for as much as she conceiving her self taken by the Enemy, cannot fly away into this or that Part, she enters into her self, and that the Animal Spirits may be pressed together, she is Contracted most strictly; if the Affection be vehement, whilst the Animal Spirits suddenly go back, from the Superficies of the Body, they greatly bind up at the same time the Pores and Passages, as it were fastning the Doors, to shut out the Enemy: from this Constriction, the Pores of the Skin being drawn inward; oftentimes succeeds an erection of the hairs, or the hair standing an end; then the same Spirits being acted into Confusion, they are inhibited from performing the wonted Offices of their Functions, and not only want the helps of Reason; but sometimes the Locomotive Faculties fail, yea by a resolution or loosning of the Nerves, made in the Bowels, oftentimes the Excrements involuntarily flow out. Further, when the Animal Faculty languishes so much, the Motion of the *Præcordia* is tyred; hence the Blood stagnating within the Bosoms of the

A Character of Fear.

How it Affects the Spirits, and all the Faculties.

How the Blood Heart,

Heart, oftentimes a swooning follows: and when therefore it is not carried lively enough into the outward Parts, a Coldness and Paleness succeeds in them. In a sudden fear, we feel a certain stiffness, whence 'tis commonly said, that the Blood is curdled in the Body; but this happens, because, whilst the Nervous Parts compassing about the Blood-carrying Vessels, are suddenly bound together, they at the same time repress the Blood from its Excursion, and so stop or plainly invert its Circulation.

In the midst of fear, lest the Spirits being driven too much into flight, the Sensitive Soul should be wholly loosened, Reason is wont to interpose something of Hope, and so by degrees to lift up the dejected Spirits, and to animate them to stay, so that this Passion being alleviated by such a remedy, may more easily pass over; but if by the strong Evil falling on one, all means of Hope be cut off, then a greater Affection, to wit, Desperation, comes in the place of Fear, in which for the most part, this Soul yielding her self overcome, wholly sinks down, and being half dead, is drowned in her proper Body, as in a Sepulcher, or if she retains any strength, presently being carried into Confusion, all things being turned upside down, she Contracts, Melancholy, or Madness.

As Desperation follows Fear, all helps being cut off; so Hope, when it is joyned to more, and more certain, of the same, passes in Audaciousness: And in this Affection, the Sensitive Soul swells up, and opposes her self dauntless to any ensuing Evil; wherefore, the Spirits Guardian, by a more strong Connexion of themselves, every where extend the Muscles, and strengthen them, by a more full Inspiration, to the bearing or resisting any thing; hence the Breast being enlarged, and then strongly bound together, a bigger Voice is sent forth; the Fists being Contracted, the Arms lifted up, the Head erected, the Face grim and threatening, the Neck swollen, and the rising up, or the stretchings forth of other Parts, shew the Animal Spirits in the whole Body, unfolded and prepared for Battel, as if about to enter into Conflict: In the mean time, the *Præcordia* being moved most strongly, by a more full influx of the same Spirits, notably rarify the Blood, and like Lightning, send it forth impetuously, and drive it into the outward Parts.

Anger is of some Kin to Boldness, in which the Sensitive Soul, by reason of the Evil unworthily brought to it, at the same time is made sad, and grows hot; wherefore, as she Contracts her self by reason of Sadness, so presently girding her self for Revenge, she is dilated; therefore, as here divers Contractions come together, this Passion is performed with a mighty Perturbation of Spirits, and of the Blood: for those affected, the beginning wax Pale, by and by they are overspread with Red; the Forehead is wrinkled, the Lips quiver, the Tongue murmurs, the Countenance is sometimes cast down, sometimes lifted up, and threatening, but the *Præcordia* are especially agitated, with a notable heat and boiling up of the Blood: which kind of Various, and sometimes Contrary Symptoms, may easily be resolved; to wit, that the Soul at once conceiving Sadness and Indignation, like the Sea working with opposite winds, has Floods excited from every Coast, and striking one against another among themselves.

Besides the Eleven Affections even now recited and unfolded, according to the Vulgar Opinion, there remains some others, excited according to the other manifold Affections and Gestures of the Corporeal Soul; the chief of which are Pity and Envy, Glory or Boasting, and Shame; which however are very near related to the afore recited, or are Composed out of them. For Pity is made out of Love and Sadness, by reason of the Evils of a Friend: On the contrary, Envy out of Hatred and Sorrow, by reason of the Good things of an Enemy: Glory or Boasting, is a certain kind of Joy and Exultation, conceived by reason of an Opinion of our Good, had from others; and Shame is a certain Sadness and Consternation of the Soul, by reason of an Opinion of our ills conceived by others. Further, Concerning this Passion 'tis observable, that when the Corporeal Soul being abashed, is enforced to repress its Compass, she notwithstanding being desirous, as it were to hide this Affection, drives forth outwardly the Blood, and stirs up a redness in the Cheeks, to wit, the Sensitive part of the Soul, as it were hiding its head, puts before her self a Portion of the Vital or the Bloody Soul, under whose wings somewhat stretched forth, the Confusion might be hid.

Besides we take notice, that the Corporeal Soul is not only affected by Objects, and their Impressions, and compelled into various Gestures, and the aforesaid Passions; but besides, she hath certain innate Dispositions, by reason of which, by the mere instinct of Nature, without any Influence of the Object, she puts forth her self, and is excited into certain Emanations or Spontaneous forces: Of which sort are first an amplification or enlarging the Individual Person, and then a Propagation of its Kind. It is Natural for every Animal without example or teaching, to seek for, and swallow down its food,

It often passes into Desperation.

In like manner Hope into Audaciousness.

To which Anger is of Kin.

The Character of Anger.

There are more than Eleven Affections.

Pity, Envy, Boasting,

Shame, &c.

A Character of Shame.

Innate Affections.

both

both that the Body may be daily increased to its due Magnitude, and also that the Soul, being daily supplied with a new Store of Spirits, may be co-extended to the Body, and be able lively to perform the Acts of her Functions. Then, as soon as the Lineaments both of the Body and Soul being sufficiently drawn forth, and the Bulk and Compass of either are Completed; some Animal Spirits flowing over from the work of the Individual, begin to abound, and then being separated into the Genital Parts, with a subtil Humour picked from the whole Body, destinated for the Propagating the Species, as it were in a Store-house, and there layed up, they form there the Idea of a new Animal; which afterward is transferred into a convenient Womb, to be perfectly formed. When the Seeds of a new Animal are so lay'd, the whole Corporeal Soul is drawn with all its Powers into this work of Propagating the Species, more than of the Conserving of the Individual: wherefore the Blood supplis the Testicles; no less than the Brain, with a most subtil and noble Matter for the store of Animal Spirits: and when after too great Expence, the Spirits are deficient in them, that presently the loss may be made up, oftentimes the Brain and Nerves are defrauded of their due Pension, and are suffered to languish, that in the mean time the Blood may pour forth more plentifully spirituous Particles into the Spermatick Vessels. Yea it is thought, that it doth sometimes snatch the Animal Spirits from the Brain it self, which it bestows on the Genitals, in the Act of Venery: For it appears so, when by immoderate Venery, the Brain presently labours with a want of Spirits; for as much as from thence there is no passage for them, to the Spermatick Vessels, but by the Blood; if that the Animal Spirits superabound with a Prolifick Humour, Swelling up within the Genital Parts, presently the whole Corporeal Soul, as it were incited, to the begetting of a young one, is inclined to Concupiscence or Lust: The Incentives of Lust, even against the Mind, are sought for, and they are lay'd hold on, however brought by any Sense; the Blood boils up, the Marrow in the Back grows hot, the Eyes are inflamed, the Genitals are inflated, so that there wants little (unless Reason coming between recalls her, and Prohibits her from the Beastliness of it) but that the whole Corporeal Soul, on every occasion, should be dissolved in Lust. In these kind of Affections of Concupiscence, may be most clearly discerned the distinct Strivings, and contrary Endeavours of two Souls: because, whilst the Corporeal Soul being incited to Lust, inclines her self wholly towards the Genital Members, and Compels thither greater floods of the Blood, and greater store of the Animal Spirits, the Heart and Brain being left wanting of Provision; on the contrary, the Superior Mind, rising up, and shewing the Commands of Reason and Religion, shews a receipt to the other, and Commands that the Animal Spirits return to their tasks, to be performed within the Brain, and also that the raging Blood should be recalled towards the *Harmonia*, and being there suppressed, might be restrained from disorderly Excursions; Hence, the flame of Lust being re-extinct for a time, and the Powers of the Inferior Soul being reduced into Order, the Acts of Sobriety, Prudence, and of other Science, and Discipline may be exercised; but if the reins of Reason be let loose, or new incentives of Lust are brought, the Corporeal Soul, shaking off the yolk, snatches her self again to the like Enormities.

Viz. An Inlargement of the Individual,

A begetting of its Kind.

Venus an Enemy to the Brain and Nerves.

The madness or fury of Lust,

Reason suppresses its flowing.

There remain yet some other Affections of the Corporeal Soul, as Sleep and Watching, Grief and Pleasure, excited in private Members; which, for as much as they respect not the whole Soul at once, but this or that Portion of the Body, or Peculiar Powers of it, and chiefly the Sensitive or Locomotive; therefore we shall handle these anon, and shall next proceed to the Sense and its Kinds.

CHAP. X.

Of the Sense in General.

The Vital or Flamy part of the Corporeal Soul, being rooted in the Blood, seems not much to know or perceive what things are offer'd outwardly to, or acted inwardly in the Body: So, altho the Blood have life, yet 'tis scarce sensible or knowing, for this which ought to be always employed, with a perpetual Motion, and even in kindling, for the Offices for the sustaining of Life, cannot be at leisure to mind any smaller Matters, or outward Accidents. Indeed great Passions also in some measure disturb the Blood, and pervert and variously drive it from its wonted Course, and like violent Blasts, shake not only

The Blood is animated, but hardly sensible

The lucid part of the Soul feels or perceives the impulse of all Objects, and is moved by them.

only the Leaves or Body of the Tree, but also sometimes pull up the Roots out of the Earth : So whatsoever mutations or alterations happen to the Blood, proceed either from the Complexion of its Liquor being changed, or from the impulse or incitation of the containing Bodies. But the other Sensitive part of this Soul, which being diffused within the Brain and stock of Nerves, is Co-extended or equally stretched forth with the Organical Body, and almost with all its Parts, is affected with every Contact, or with the meeting of other Bodies, she perceives all Impressions either outwardly objected, or raised up within ; and as she is moved by these, every where diversly inflicted, she induces according to the various impulse of the Objects, various Gestures and Species in her self, and also draws the Members and Parts of the Body it self, with her wholly into the same Figures and Motions. For indeed it is the Energie or the Act of the Soul it self, from which every Function of the animated Body primarily and chiefly arises. If at any time any Stroke or Impression be inflicted any where to the animated Body, presently a certain Fluctuation or waving is stirred up in the *Hypostasis* of the whole Soul, or of the struck Member ; by which, some Animal Spirits or subtil Particles, shut up in the Organical Parts, as a blast of Wind in a Machine, being struck, run hither and thither, and so produce the Exercises of Sense and Motion in the whole Body, or respective Parts.

Sense and Motion, are the chief Advancers of the animated Body.

Truly, among the various Gestures of the Corporeal Soul, by which, she altering her Species or *Hypostasis*, brings a change to the containing Body, the Sensitive and Locomotive Powers obtain the chief place ; for as much as they are Common almost to all living Creatures, at least to the more perfect, to which also all the rest of the Faculties may easily be reduced. These are the chief Advancers of the animated Body, upon which all the other Wheels of this Self-moving Divine Machine depend.

The efficient Cause of either, are the Animal Spirits.

But the Internal and next efficient Cause, both of Sense and Motion, are the *Hypostasis* of the Sensitive Soul, or the Animal Spirits, instilled from the inkindled Blood into the Brain, and from thence diffused into the Nervous Stock : which being distributed from the Brain, as the Fountain thorow the Nerves to the whole Body, imbue, irradiate, and blow up all the Parts, and bring a certain Tensity or stretching forth to each ; so that the passages of the Nervous Bodies, like Cords stretched forth straitly on every side, from the Brain and its dependencies, reach forth into all the Exterior Parts, by which, so stretch'd forth, and actuated by a certain Continuity of the Soul, if one end be struck, presently the stroke is perceived through the whole, so that every Intention conceived within the Brain, presently performs the designed work, in every Member or Part ; and on the other side, every impulse or stroke, which is inflicted from without to any Member, or to the Sensitive Body, is communicated instantly to all the Parts within the Head. If that an Impression or force tends from the Brain outwards, thorow the Nerves into the moving Parts, Motion is produced ; but if they being made outwardly, are directed inwards towards the Brain, Sense arises. But whil'st either of these are performed, it is not so to be understood, (as is commonly asserted) as if the same Spirits make hast, and leap back presently, as it were from one end of the Course or Circuit to the other ; but as the Soul is stretched forth, thorow the whole, with a certain Continuity, its Particles, *viz.* the Spirits contiguous one with another are set like an Army in Array ; for they after a Military fashion, whil'st they move not from their station, and keep Order, perform their Offices ; and whether they be set in Battel Array, or on the Watch, they perform the Commands carried outward from the Brain, themselves being almost immoveable, and effect Motion, and deliver presently to the Brain the news of any sensible thing impressed, whereby Sensation is made. So indeed, the same Animal Spirits, tho' with an opposite and inverse tendency, and aspect of them, cause Motion and Sense : But both Faculties, as to the Exercises of their Acts, require something divers Organs ; yea, the Animal Spirits planted within the same ; for the performing the divers Offices of their Faculties, are ordered with a various Affection, and with a different manner of Orders. That each of these may be the more clearly illustrated, we shall first of all speak of the Sense, and of whatsoever belongs to it both in General and in Special, and then afterwards concerning Motion.

An opposite tendency of them, effect both Sense and Motion.

What the Sense is.

The approach of the sensible Object, is made either by Contact, or by Effluvia's sent forth, or by reflected and repercussed Particles of the Air, Breath, or Light.

The Sense, as it is taken in a more strict acceptation (*viz.* for the proper Function in animated Bodies, and by which they are distinguished from inanimates) is wont to be described after this manner ; *That it is the faculty of perceiving Sensible objects.* Because the Sensitive soul, as hath been said, being apt to be affected or moved, by every Contact or Impulse of an exterior Body, forces its constitution to vary in the whole, or in part, according as it is struck ; But exterior Bodies, because they consist of Particles, of a various Kind, and diversly figured, therefore, when some are applied to others, their approaches one among another, are not always made after one and the same manner, but after a manifold manner, and with notable variety ; to wit, either by Corporeal Contacts,

tacts, or by Effluvia's falling from them, or by Particles of Air, Breath, or Light, reflected from them, issuing from them on every side like Darts. Further, and to every one of these Kinds, many Species are attributed: Because, not only Concretes, but also various little Bodies of the same Subject, shew and impress manifold Types of their Contacts; several of which, as they are received and so known distinctly, by living Creatures, the Sensitive Soul using Corporeal Organs, hath many Sensories, fitted for such variety of Objects, and divers representations of things; in which several, both the Conformati^on of the Pores, as also the disposition of the Animal Spirits, are proportionated to the little Bodies, sent in from the Object, which are only of one Kind, fitly to be received. By this means sensible Impressions, at least that may be of use to any Animal, are perceived, and from this manifold way of Sensation, proceeds the Knowledge of all things, according to that of the Philosopher, *All Knowledge is made by the Sense*; when on the contrary, if Bodies and their Particles, should strike the *Systasis* of the naked Soul, or part of it, always after one and the same manner, nothing at all would be known, because one thing or parts, from another, or these from those Members, would not be distinguished. Wherefore, that all the chief Objects and their Accidents, might be distinctly noted, it is so provided, that some Particles strike this Organ and not that; so that they affect their several respective Sensories only, the rest being untouched.

As these several are made manifold, they require divers Sensories.

All Knowledge from Sense.

From hence it is clear, that 'tis necessary that there should be many Sensories in perfect Animals; which may perform divers Actions, both for the preserving of Life, and propagating the Kind, and also for the knowing many things, and chiefly for the embracing of what things are Congruous to themselves, and for the shunning all incongruous things; for these things 'tis needful, that the Sensitive Soul should be affected by the Objects, after a various manner, and so perceive their manifold Influencies. How vile their Condition is, and how hard their Lot, that are gifted with the only sense of the Touch, appears from the Life and Operation of the more imperfect Animals, as Oysters and Lymkins; then besides, how false is the Opinion of some, who say, That every Sense in all Animals is the feeling only; for altho every Affection is made by Contact, from the Object to the Soul; yet neither is the same thing still employed, nor received after the same manner; but how many types soever of sensible things are to be found, so many Counterfeits remain in the Sensories.

In Perfect Animals, there ought to be many Senses.

That one of the Touch or Feeling, suffices not.

Nevertheless it may here be rightly Queried, How it may be? for as much as the whole *Hypostasis* or Contexture of the Soul, is made up of most subtil and also most highly moveable Particles, that every one of them wheresoever implanted, are not indifferently moved, by every sensible stroke; when especially the Interior frame of the Soul, which is Common to all the Sensories, receives this Affections of every one, and so is immediately affected by every sensible thing: I say, why the Spirits implanted in the Eye, do not equally perceive Sounds and Smells, as they do Colours? for as much as they inhabiting the streaked Bodies, discern both these, and all other sensible things.

How the same Spirits receive sensible Species so very divers.

For the resolving of this Problem, these two things are to be supposed, to wit, first, That the Structure of every Sensory is so made, according to its Pores and Passages, that Particles only proportionate to them may be admitted in: wherefore as Light, and the Images of things, pass thorow Glass, and clear Bodies; not dark Bodies; so the same are received only by the Eyes, and not by the other Sensories: The same Reason holds of all the rest. For we may observe, when in the Circumambient Air, or in the Atmosphere, there are Bodies of a various Nature, and of a divers Configuration, that some things affect this, others that Sensory, and so the things which are of a several Kind affect the particular Organ of the Sense. As for Example, the Particles of most thin Air or Light, which seem to be of a Sulphureous Nature, being reflected from Bodies, Convey (as was said) their Images into the Organs of the Sight or Seeing; the little Bodies of Air which seem to be saline, being reperfused from Solids, shake the Drum of the Ear, by their leaping back; yea, and the same being made clammy by a sweet dew, or moistned, affect the taste; the Particles of the same Air, filled with sweet Exhalations, strike the Nostrils: And lastly, The same stuffed with warm or cold Effluvia's, move the Sense of Feeling: But in the mean time, the Particles of the same Air or Element, which are proportionate to one Sensory, are incommunicable to the rest.

That this may be done are required,

First a Structure of the Organ after a diverse manner.

But Secondly, the Animal Spirits themselves, which reside in the Organs of the Senses, and that are like Watchmen, are furnished for the respective meetings of the Objects, with a certain peculiar Provision, and an appropriate manner of Disposition: for when some Spirituous Particles, more pure than others, and more subtle exist, some more dull or blunt, others notably moveable, these Naked, those smered with Humor, and marked with many other Affections; it is so provided, that as the Naked Spirits, or those less

Secondly, a Various Constitution of the Animal Spirits.

gifted suffice for the Sense of Feeling, these without any farther indowment are disposed every where in the Membranes, and fibrous Flesh; but the most pure Spirits, and as it were Chrystalline for the Sight, flow into the Eyes; those that are highly moveable are fitted for the Hearing, and the more Viscous, which are fused with a requisite Humour, for the Taste, and Smell.

These things being thus premised, concerning the Multiplicity and Difference of the Senses, and the Organs, we will now inquire into Sensation it self; by what means, and after what manner it is performed: Concerning these we thus say in general, that the Object being applied to the Sensory, (whether it be done immediately, or the Particles of the Air or Element coming between) doth impress its Idea or Character on the Spirits implanted in that place; and in the same instant, by a continued Series of the Animal Spirits, as it were an Irradiation, the Type of its Impression doth pass from the Sensory to the Head; and whilst the Spirits actuating the streaked Bodies, are in like manner affected by it, a perception of Sense, begun from the Organ, is formed.

That Sight is so performed, Dioptrick Experiments do plainly shew, by which, the same Species of any Body, by a Glass artificially placed, may be Carried or Reflected hither or thither, and may be figured and beheld at once in several places: why in like manner, may we not Conceive the Image of the Object represented in the Eye, as in a Glass, to propagate its likeness from thence further to the streaked Bodies? But as to the other Sensories the Business seems more hard to be unfolded, because the sensible Species, for as much as they are more Corporeal or thicker, cannot be conveyed to the Head with so quick a passage, and almost unperceivable like Lightning; but as to these, it is to be understood, that altho the Smell, Touch, and Taste, require more near and more Corporeal approaches of the Object, than either the Sight or Hearing; yet the Animal Spirits, which as it were *internuncii*, are placed within every Organ, and the chief Sensory, equally and as easily transmit the stroke or impulse of every Kind; Because as the Spirits are diffused thorow the whole Nervous System, and thorow the Head it self, as it were with a continued beaming, every Impression by the stroke of the Eye gets sooner from one bound to the other; yet the Character of the Object, is conveyed by the like Motion of their Neighbors, and as it were by a certain waving, even to the streaked Bodies.

Hence it follows, that for the Act of Sensation, these two things are required. First, That the sensible Species be expressed, so as it may be impressed on the Sensory: And Secondly, That the Idea of the same Impression, be carried thence, by a like Affection and Motion, by the Spirits flowing in the intermediate passages, to the Common Sensory; for otherwise Sensation is not performed, as it appears, when being intent on other things, we take not any notice of any Objects, tho they approach near to the Eyes, or the other Organs.

But here we may have a Cause of Doubting, how the manifold Species of sensible things, for the receiving of which, many Organs, and those diversly framed, are required; do all come together within, and are discerned in the same Common Sensory; For it is a wonderful thing, that the same streaked Body, consisting of a make not much unlike, should admit, and know distinctly in it self, the universal Idea's of Objects. As to this we may say, that the Images of things to be perceived by the Sense, are not distinctly painted in the Common Sensory, as on a Table; but every Impression there shown, depends on the Motion, as it were by a certain waving, of some Spirits separate from others, and within these or those peculiar Tracts of them: Nor is it irrational to affirm, that some Spiritual Particles are moved within the *Hypostasis* of the Sensitive Soul, and her the same Portion of it, whilst others lye quiet, lying between them; for it plainly appears, and which afterwards is more largely shown, that within the Body of the Air, the lucid Particles are agitated, whilst the rest lye at ease; yea also, that Sonorifick, yea and odorous little Bodies, and perhaps many others of another Kind, are moved by a distinct and peculiar Agitation apart by themselves, from the other texture of the Air; for both Images pass thorow, Sounds are poured out, Odors flow, warm or cold Effuvia's, and other little Bodies are variously carried; yet notwithstanding, others in the mean time are neither driven by force by some others, nor is the Consistency of the whole Air disturbed by some Singulars. Yea, various Impressions, not only pass thorow the Air unchanged, but also the Superficies of the Water; for we have observed in a River, or a Fish-pond, when many wavings have been stir'd up, by various and divers strokes together, that all of them, however they meet one another, pass thorow, or cut one another, continue still distinct, and unconfused; why then may we not suppose, that in the *Airy Syssasis* of the Soul, (which also is founded in a Watry Humor) there are Particles of a various and unlike make, and that manifold Species, by

After what manner Sensation is made.

All sensible Impressions do beam forth from all the Organs, into the streaked Bodies.

In every Sensation is required, First, That the Species be impressed on the Sensory.

Secondly, That it be carried thence, by the passage of the Spirits to the Common Sensory.

How the divers sensible Species are distinctly represented, in the same Common Sensory.

It is shown by an example of the Air, whose divers Particles have divers carryings forth.

Also by the example of Water, in which, many wavings being at once made, are all distinct.

their

their passing thorow, may be at once brought to the Common Sensory, without Confusion? As for Example, Suppose that for seeing most Subtil and as it were Ætherial Particles, others almost Saline and notably moveable for the Hearing, and so for the other Senses, Spirits endowed after this or that manner, to be interwoven together; and every peculiar Sensation to be produced, by a particular affection of them; to which it happens, that for the various passing thorow of the Spirits of so diverse a Nature, divers Tracts or Paths are produced, both in the Organ it self, and in the Common Sensory: and so, when the Animal Spirits are affected; which are of this or that Nature apart from others, which are of another Nature, and as there are beamings forth of several kinds, as it were within various Inlets or Passages; 'tis no wonder, if in divers Organs, distinct Acts of Sensations are performed; and that all of them, however different in Kind, and coming together from many ways, are shewn within the same Common Sensory, to wit, the streaked Bodies; because in this Marrowy Part, Spirits of every kind abound, and also passages of every sort of Conformation are found; therefore, every Impression impressed on any Organ from without, may be distinctly represented in this same Body. That it is so, it more clearly appears from hence, because both the streaked Bodies, and the way leading to these, consist of many white Ligatures, which seem as so many soft Nerves, or marrowy Tracts, for the divers ways of receiving the Impressions of sensible Species.

The like is in the Airy Hypostasis of the Corporeal Soul.

For the divers Perceptions of which, together, in the Common Sensory, there are many and distinct Tracts produced.

When a sensible Impression is brought through the Animal Spirits, being affected by a continued Series, from the Organ to the Common Sensory, if it be light it is there terminated, and the perception of the External Sense quickly vanishes, without any other Affection; but if (which more often happens) the impulse of the Object be stronger, the Sense excited from thence, like the vehement waving of waters in a Whirl-pool, both partly passes thorow the streaked Bodies, and going forward to the Callous Body, it oftentimes raises up two other Internal Senses, to wit, the Imagination and Memory, either one or both of them; and also is partly reflected from them, and from thence, by a declining of the Spirits, leaping into the Nerves, local Motions are made.

Sensible Impressions, as they are strong or weak, stir up other Powers, either more or fewer.

For indeed Impressions of sensible things, from the beginning, furnish both the Imagination, with the Memory and Appetite, and induce the first attempts of local Motions. It is first effected, for as much as the sensible Impulse, is often propagated beyond the streaked Body, into the marrowy part of the Brain, or the Cortex, or the extremest Confines of it. But local Motions ordinarily succeed to Sensation, for as much as the Animal Spirits being struck back from the bolt or stay of the streaked Bodies, spring up outwardly, and as they enter these or those Nerves, by a certain Consequence, or by chance, they excite fortuitous local Motions, or depending on the previous Sense; for in the reciprocal exercise of these Faculties, to wit, of Sense and local Motion, (before Animals are imbued with Phantasie and Memory) almost the whole Animal Function consists; because Brutes or Men, whilst they as yet know not things, want Spontaneous Appetite. So long therefore, they being destitute of the Internal Principle of Motion, move themselves or Members, only as they are excited from the impulse of the External Object, and so Sensation preceding Motion, is in some manner the Cause of it.

All the other Powers of the Soul proceed at first from Sensation.

Therefore in every Sensation, the Animal Spirits are moved; and their Motion being excited, in the utmost Sensory, from the approach of the Object, and harmonised according to its Impression, turns inwards, and (as hath been said) is conveyed to the first or Common Sensory: wherefore it is not to be thought, that the little Body's sent from the Object, do penetrate deeply, and enter the inward parts of the Brain it self (as some have asserted); but it suffices, that they being cast forth like Darts from the sensible thing, do affect the Spirits placed in the fore-front; and then, they from thence most swiftly pass thorow, by their Irradiation, the impressed Motion. As to the Parts, within which the Animal Spirits dwelling, do carry thorow, as it were by Pipes and Dioptrick Glasses, the impressed Species of sensible things; they are the Fibres, Nerves, and the Oblong Marrow, and chiefly the tops of it, to wit, the streaked Bodies. The Fibres being stretched forth in every Sensory, as it were Nets spread abroad, take the Particles of the Object, diffused and entering here and there, from which, whilst the Spirits implanted in those Fibres, are affected, and are marked with the type or shadow of the Objected thing, forthwith the same Character being expressed, by a continued Series of Spirits, passes forward, thorow the little Pipes of the Nerves, and the Medullary Trunk, into the streaked Bodies, and is there represented as upon a white wall. But the Rational Soul, easily beholds the Image of the thing there painted; or perhaps carried forward beyond into the Callous Body, the Imagination and Phantasie being excited, But after what manner Brutes perceive themselves to feel, and by reason of that Sensation, they either imprint it in their Memory, or draw forth the Acts of the Appetite, we have shewn elsewhere.

The Animal Spirits pass thorow the sensible Species; and not the Effluvia of the Object, penetrate even to the head.

The bounds and passages, by which, and into which the Species pass thorow.

The Number of the Senses is well affirmed to be Five.

So many, and not more, are requisite.

Concerning the number of the outward Senses, we shall not recede from the vulgar Opinion, affirming them to be Five; for altho in some imperfect Animals, perhaps one Sense or two are only found; and tho it may seem, that the more perfect living Creatures may exercise many more than Five; because it is possible, that the Kinds of sensible things, far exceed that Number; yet it is seen, that those Five Organs of the Senses do abundantly enough supply the wants of all living Creatures: at least it seems good to the great Creator, not to grant to Man more than these, nor perhaps better than brute Beasts have obtained: Hence we may argue, that whereas the first Notions of all Simple things, are acquired only by the showing of the Sense, and that Man, notwithstanding, is wont from thence to form Complicated Orations and Discourses, beyond what Brutes are able to do, that this is done by the Virtue and Operation of the Rational Soul in him, of which indeed Beasts are wholly destitute.

As to the Order or Method, by which we should treat of the Senses, particularly to be consider'd, if their worth or dignity be respected, it is confessed by all, that Seeing, and then Hearing should by right have the Prerogative; but indeed, because Knowledge more easily, and always more happily, proceeds from more Known things, to things less Known; therefore, I think to begin with the Touch or Feeling, as the most Common Sense; also for that the formal Reason of which seems to be most easily unfolded.

CHAP. XI.

Of the Senses in Particular, and first of the touch or Feeling.

The Sense of Feeling is more thick, but the most ample or large.

Exhibits Signs of Judgment to the rest of the Senses.

It hath a mighty diffusive Sensory or Organ.

Which are the Nervous Fibres.

In all the Parts, both External and Internal.

THE Touch or Feeling, tho it seems a Faculty of a lower Order, and as it were of a more gross Nature, because it apprehends not the object, unless it be brought near, and as it were pressed with its Arms; yet in some respect, it is more excellent by far than the rest; because this Sense beyond all others, receives and knows the Impressions of many sensible things, and those inflicted with greater variety; and so obtains a most large, and as it were a general Province. For since that the Sensible Qualities so called, are manifold and divers, to wit, Heat and Cold, Moisture and Dryness, Hardness, and Softness, and other Modifications of Bodies, their Make, Motions, Influences and Types, or Figures of Appearance, which in Concretes result from the mixtures and divorces, or the various Transpositions of the Elements, the greatest part of them by much, are the proper Objects of Feeling, and are discerned only by its Judgment, and as it were by its Will. Further 'tis observ'd, That the Touch or Feeling, gives notes of Judgment to all the other Senses concerning uncertain Objects: for when the Sight cannot distinguish a Ghost or Spectre, from a solid Body, by the tryal of Feeling, presently the thing is put out of doubt; so likewise of the Smelling and Taste, which oftentimes put away sensible things brought to them, and fear their near Embrace, unless first tryed by handling.

But this Power, as it enjoys great variety, as to its Objects, so it hath a most ample Sensory, and equally extended almost with the whole Body; That indeed few Parts, either within or without, but partake of this Sense. Further, this Faculty, for that 'tis of a general and common use, insinuates it self into the Organs of the other Senses, destinated to the private Office of every one: For both the Tongue and Nostrils, also the Eyes and Ears, perceive heat and cold, hardness and Softness, and other tangible qualities, no less than their proper Objects. If that we should further inquire, what the immediate Organ of Feeling is, in the several Members, or Parts? it may be said, that it is the Nervous Fibres, every where stuffed, and as it were distended with a Company of Animal Spirits; which as the Strings of a Lute, as often as they are struck by the strokes of Tangible things, propagate the Impulse every where received, by the passages of the Nerves, forthwith to the Common Sensory. For as such Fibres being thickly set, are interwoven in the Skin, the fleshy Pannicle, the Membranes, and Muscularous Flesh, yea, and with some of the Inwards, so that the Approaches of outward Tangible things, are not only felt in the Palm of the Hand, or the Superficies of the Body, but as often as sharp Humors are brought within into the Bowels, or that Preternatural Contents cause a pulling or hawling; a troublesome Sense of it is felt; wherefore the proper Organ of Feeling, is neither the Skin, nor the Flesh, nor the Membranes, as hath been asserted after this manner by some, and after that manner by others; but the Fibres

Fibres are that Organ, implanted in the whole frame or make of these or those Parts.

Altho many sensible Fibres are placed every where thorow the whole Body, also, tho there are divers and manifold Tangible qualities; yet it is not to be thought that these Fibres, that they may be the better fitted for those qualities, are of a different Kind or Conformation; for neither are there some Fibres, by which heat, or others by which cold, or others different from either, by which other Tangible things are perceived; but the same Fibres, are every where alike, and receive and distinctly carry the approaches of every Object, for neither do the sensible Fibres, planted in divers places or parts, acquire a diversity of Office, so that one Member should be the Index of heat, another of cold, or another of a several Tangible thing, but every one indifferently feel almost all Tangible things, from every Fibrous Part. The reason of the difference is, because the Fibres, tho of the same nature and frame, enter into divers ways of Contractions or wrinklins, from the various strokes of sensible things; even as the strings of an Harp, from the various strokes of the Musitian, give forth different Sounds; so also, the Fibres, which are the Instruments of Touching, are affected after a different manner, by the various impulse of Tangible things. For it seems, that these are irritated or provoked one way, with heat, and another way with cold, and so from the rest of the Qualities, after a manifold manner; therefore, the Animal Spirits implanted in them, enter into a peculiar way of Gyration or turning round, or of undulation or waving, according to which, the Spirits being harmonized, which flow within the passage of the Nerve belonging to those Fibres, do propagate the same Figure or Type of their carrying forth, to the Medullary Stock, and by its means, to the Common Sensory.

Which Fibres, tho every where of the same Conformation;

Yet Exhibit various Species, according to the various approaches of tangible things.

The Tangible Species being impressed after this manner, on the Nervous Fibres, or the outward Organ of the Touch, are not always carried from thence, or at least not immediately to the same Common Sensory; for we have shewed elsewhere, that some Nerves spring from the Parts of the Brain, and others from those of the Cerebel; wherefore, when they direct the Impulse, hap'ning outwardly immediately to the striated or streaked Bodies, these latter convey the Sension from the Fibres, which are planted somewhere more inwards about the Viscera to the Cerebel; from which (without Knowledge of the Animal) oftentimes involuntary Motions are retorted: as when Vomiting follows upon an Emetick Medicine, unknown, and against our Minds. If that this private Sension belonging to the Cerebel be a little stronger, and vehement passing thorow the same Cerebel, goes further even to the streaked Bodies; as when Medicines provoking the Stomach, more sharply, induce a Sension or trouble about the Heart, or otherways molestious, which they plainly give notice of.

Tangible Species immediately carried either to the Cerebel, or to the streaked Bodies.

Further, when the Tangible Impression arrives first and immediately at the streaked Bodies, if the same be light, it is there terminated, and the sensible Species presently vanishes; but if the Impulse of the Object be somewhat stronger, it passes further to the Callous Body, and oftentimes to the Shell of the Brain; and therefore their Affections, Imagination, and sometimes Memory, gather'd from the touch of the thing, succeed: and when, the sensible Species being also dilated to the Common Sensory, a divergency or bending down of the Spirits, from thence is reflected into the same Nerve, or others related to it, so it stirs up local Motions. These sort of Effects are sufficiently known by the Common Proverb, *Where the Pain is, there the Finger will be*: for it is implanted by Nature in every Animal, to rub or press the place with its finger or foot, where any sense of Trouble or Pain is.

And from thence goes forward, sometimes to the other Faculties, Viz. the Imagination, Memory, and Appetite.

As to the Kinds and Differences of Feeling, both are taken, either from the Objects, or from the various affection of the Sensory: the ways or means of the former, are so manifold, that they cannot easily be recounted; for hither ought to be referred (as we said but now) the universal Tangible Qualities; By Tangible Qualities we understand here, the various habitudes of Natural Bodies, which arise from the Crasis and Disposition of the Elements, of which they are made; as also from their Intestine Motion, or Effluvia's variously appearing in themselves; which kind of Modifications of Bodies, the Sense of Feeling chiefly finds out, and makes their knowledge or marks so certain, that when we do not believe the Scrutiny of the other Senses, we are wont to rest satisfied with the Examination of this.

The Kinds and Differences of Feeling, are either, In respect of the Object;

Concerning the Species of Feeling, Constituted in respect of the Sensory, we shewed even now, that the sensible Impression was immediately derived from the External Organ, either to the streaked Bodies, or to the Cerebel: Therefore, for that Reason, Sension is either manifest, and knows plainly every thing; or private of which the Animal is scarce knowing: but the Consequence declares this Kind of Sension to have been stirred up: for a Motion being made in any inward unseen, argues a previous sense of it to have

In respect of the Sensory.

And so it is either manifest or private.

have been ; as from the change of the Pulse, or a failure of Spirits, shews a certain Malignity to have affected the *Præcordia*, or the Cerebel.

*Pleasant or
Sad.*

In either of the aforesaid Kinds of Sensation, to wit, whether the same be manifest or private, the Tangible Impression, either coming pleasantly to the Fibres, gathers together the Spirits implanted in them, and more nearly delights them, and strokes them with a soft and gentle rubbing, whence pleasure arises ; or the Impulse of the same, pulling and wrinkling the Fibres, distracts and dissipates the Spirits one from another, and so Grief, Pain, or Trouble Succeeds : But concerning these Affections, *viz.* Grief and Pleasure, we shall have hereafter a more fit place to speak of them ; so that it next remains, for us to proceed, from the Sense of Feeling, to its nearest Neighbor and Relation the Taste.

CHAP. XII.

Of the Taste.

*The Taste a Kind
to Feeling.*

*The Sensory of
the Taste discerns
its Objects, and
is delighted
with those
things that are
Convenient.*

*Venus or Pleasure
is necessary
for the preserv-
ing of the Indi-
vidual.*

*The Organ of
the Taste, is the
Tongue, with the
Palate, and
Throat.*

*Eating is a cer-
tain Solution ;*

*Wherefore one
savour, often-
times excludes
another.*

THe Taste is so like to the Sense of Feeling, that it seems to be a certain Species of it ; and certainly the Object, in either Organ, ought to be brought near, and laid upon it ; yea in tasting, to be admitted more deeply within the Pores and its passages. Upon this Sense, depends chiefly both the Life and Vegetation of Animals ; for this chooses and takes in Juice for nourishment convenient, and that by this Office it might be constantly and rightly performed, it is furnished with a faculty, or a certain implanted Judgment, whereby some wholesome and agreeable Aliments, fit for every Individual, are discerned from those that are disagreeable and hurtful ; also further, as it were in reward of its work, it is delighted after a notable manner, with the Exercise of its Function ; For unless convenient agreeable things, fit to be Eaten, move Spittle, and as it were prickle them with a most grateful pleasantness of Taste, the appetite of desiring or taking of Food is quickly extinguished, with oblivion or tediousness ; so for the preserving the Individual, no less than the Species, Desire and Pleasure ought to be had.

The Sensory of the Taste is not so diffusive, and almost Co-extended with the whole Body, as that of Feeling, but is limited to one part only : yea, and its Sensible is of one Kind only, to wit, a Savoury thing, nor does it include, as the Tangible Quality, the Subjects of many Catagorical things. Indeed the chief and almost only Organ of the Taste is the Tongue ; to which, after a manner, but obscurely, do consent the Palate and the Upper part of the Throat ; But in all of them, the Nervous Fibres are the immediate Instruments of Sensation ; wherefore 'tis observed, that the Tongue is notably more Fibrous than any other part, also consists of a very porous Contexture ; for this end, that the savory Particles of the thing, might be more plentifully, and more deeply admitted, into the passages of the Sensory, and so meeting at once with many Fibres, might excite a more acute Sensation : yea, it may be suspected, that whilst the subtil Particles of the savory Humor are imbibed so deeply by the Tongue, the Animal Spirits do in some measure snatch the same, for their nourishment, and convey them inwardly, by the passages of the Nerves, towards the Brain ; for it plainly appears, that in great Fastings or want of Food, and swooning or failure of Spirits, that a refreshment of them immediately follows, upon the first tasting of any noble Liquor.

Eating is a certain Kind of Solution, whereby the savory Particles may be the better taken in, from the Food by the Sensory : Because, whilst solid eatable things are reduced into bits, by Chewing, the Tongue, and other parts of the Mouth, and Throat, pour forth as it were a certain Menstruum, which washing and as it were Elixivating the savory little Bodies, carries them into the Sensory, and insinuates them into the Pores of the Tongue : Further, The savory Particles, because so impacted in the Sensory, do employ its passages, hence it comes to pass, that one savour not rarely excludes another ; so sweet things being tasted, because they are clammy, and very obstructing, hinder or pervert the more exact taste of Wine ; wherefore, that the hindered Faculty might be again restored, salt or sharp things are eaten, which may open the Pores of the Tongue, and clear away the sticking Viscousness.

As to the Nerves, which serve to the Fibres of the Tongue, thickly interwoven with it, and which carry the Impressions of Savours, to the chief Sensory, it seems, that they are of a double Kind: for as Nerves are inserted in the Tongue from both the Fifth, and the Ninth pair, and are every where distributed thorow its whole frame, with a most thick Series of shoots, it is very likely, that they are both Sensitive. Concerning the Nerves sent hither from the Fifth pair, the thing is out of doubt; and as from the same pair, other shoots are sent into the Nostrils, hence we may say, the reason is, of that Consent, which is between both these Sensories; but indeed, as to the Nerves bestowed also on the Tongue, from the Ninth pair, it may be something doubted, because it is commonly believed, that the Office of these serve to the Motion of the Tongue, and to Speech; wherefore, from the same pair are sent certain branches into the Muscles of the Tongue, and of the Bone called *Hyoides*, which without doubt are destinated for their Motion: Nevertheless, tho' it be granted, that the Nerves of the Tongue and its Appendix, inserted from the Ninth pair, do bestow on them the moving Power (which indeed is necessary to this Part, as well for Tasting as for speaking; to wit, as the Tongue is very versatile, it takes in with delight the Savours from every corner or recess of the Mouth) yet what hinders, that however the same Nerves should not serve for both, to wit, Motion and Sense? For it appears, that many Nerves which serve for the Sense of Feeling, do in like manner serve for the performing of the Motions of those Parts to which they belong. Wherefore, as Tasting is a certain Species of Feeling, it is probable, that it enters in some measure through the moving Nerves of the Tongue it self; neither does it appear otherways, for what end Branches of the Nerves, derived from the Ninth pair into the Tongue, disperse such thick-set shoots into its whole frame, unless they should serve for the receiving of the Particles of Savours, coming from every Part. But for as much as after this manner, two Nerves of a distinct Original belong to the Tongue, and one of them arises from the Parts of the Brain, and the other from the Cerebel: Hence a Sensation being carried inwards by the same, it is stay'd from either at the Common Sensory, and so according to the diverse Nature of the Object, a pleasant and delectable fruition, or an ingrateful and sad Aversion, at once in either Government the Imagination and the *Præcordia* are affected.

The Nerves, sent to the Organs of the Taste, proceed partly from the Fifth pair.

Partly from the Ninth also, which serve for the Motions of the Tongue.

It is in like manner observed of the Touch, that the same Nerves serve both for Sense, and Motion.

Wherefore from the Taste of a pleasant thing, the Imagination and the Præcordia, are wont to be affected.

The rest of the Senses, wait upon the Taste.

There is a sufficient indulgement to the Taste, for a reward of its necessary work, to wit, Eating; therefore its Objects are sought far and near, through the Regions of the whole World, yea and all the Elements are employed. Further, as to its Ministry, all the rest of the Senses serve to this, for nothing pleases the Palate unless the Sight, and Hearing, Smell, and Touch approve it. 'Tis fit it should be so, for this Sensory, by which Food is conveyed for Humane Life, and that it might enjoy great variety, for the shunning of nauseous things; and use a guard upon the rest, for Discrimination; lest instead of Food, it might unawares take Poison.

The Speculation of Savours, (which are the next Object of Taste) contains in it self very many Pleasant, and no less Profitable things; wherefore I think it will not be from the Matter, to turn aside here a little into this Theory; and as we shall divide all Savours into Simple and Compound: First, we shall rehearse what Nature suggests of that Kind particularly, according to their several differences, both of themselves, and of the Subjects in which they are; Then Secondly, we shall add the Parallels, by what means, and by what service of Art, the same Savours in Subjects are produced anew, in which they are not by Nature; Thirdly, After what manner Savours both Natural and Artificial, are any way altered and changed in their Subjects, or wholly perish. It will be worth our while to discourse briefly concerning these, and lastly, somewhat of Compounded Savours.

Savours the Object of Tasting. Simple or Compound:

A Threefold Consideration of them, to wit, which are,

1. Whose Original are natural.
2. Artificial.
3. The Alteration or Abolition of either.

Nine Simple Savours:

Sharp Savour.

Savours called Simple, are commonly counted to be Nine, viz. Sharp, Bitter, Salt, Acid or Tart, Astringent or Biting, Sour, Sweet, Oily, insipid or without Taste.

The first is sharp or biting Savour, such as is felt in Pepper or Pellitory, being chewed; which probably arises, as often as the Particles of any Body are smooth, and sharpened, and after that manner figured, like the Stings of Nettles, that they may prick and very much dig into the Sensory. In Subjects indued with a sharp biting Savour, a volatile Salt, or an Alchalisat, or suffering a Flux from Fire, very much exceeds other Elements.

First, Concretes, which have by Nature Particles so figured, are accounted among Vegetables Hearts-ease, or Trinity-Herb, Pepper, Aron, Country-Mustard, Sea-Lettice, or Milk-thistle, Mustardseed, Pellitory, Ranunculus, &c. Of Minerals Arsenick, Sandarach, &c. Among Animals it is scarcely met with, nor among their Parts, a savour of this Kind, unless perhaps some Insects, as Cantharides, &c.

1. Which are sharp or biting of their own Nature.

Secondly, Sharp biting Bodies produced by the help of Art, are Mercury Sublimate, Butter of Antimony, Strong-Waters, and Causticks, the fixed Salts of Herbs, made by burning to Ashes, Calcined Vitriol, the Ruff of Brass, &c. The softer things suffer Calci-

2. Which are so produced by Art.

Calcination, and Fusion in the Fire, the more biting sharp they are made; because, by this means, the Pricks and Spears of the Particles are sharpned. An Example is in the fixed Salts of Herbs, calcined Vitriol, the Infernal Stone, &c. Bodies which are biting sharp, and Corrosives mixt together, and committed to the Fire, acquire a most sharp force of burning. An example is in Mercury Sublimate, and Stygian Waters, the reason of which is, because Salts of a like Kind, being mixed together, joyn their forces or edges, and are at the same time very much sharpned by the fire. It happens otherwise to Salts of a divers Kind, as are Spirits of Vitriol, and Salt of Tartar, mixed together; Sugar and Honey subjected to distillation, exhale a Caustick Water; also the Spirit of Wine highly rectified becomes biting sharp, and burning; because the Saline or Spirituous Particles, in both Substances being deprived of the sweetness of the others, put forth their Spears and Pricks.

3 By what means the biting sharpness is wont to be taken away, or altered.

Thirdly, Which was the Third Proposition, the biting sharpness in Bodies, both Natural and Artificial is put away or altered after various ways. Mercury Sublimate highly Corrosive, if another quantity of live Mercury be added and sublimed, it takes away all acritude or biting sharpness, and it becomes insipid or without taste. The reason of which is, that when the Particles of the added Mercury, do grow to the little Spears of the Salts, they do thereby become more thick and obtuse. The Spirit of Vitriol and Salt of Tartar, being melted (which two are biting sharp and corrosive of themselves apart) if they be put together, lose all acritude; to wit, these Salts being of a divers Kind, viz. Fluid and Alchalisat; being put together, work mutually one upon another, by which means, the little Spears and Pricks of both are broken; even as if the edge of one Knife, should be rubbed against the edge of another. Plants and Herbs, which are naturally biting sharp, if they be macerated in White-wine, (or perhaps in any other Liquor) put away all their sharpness; and yet the Liquor becomes not at all sharp. In these sort of Concretes, all the acritude depends upon the volatile Salt, which being loosned, by the mixture, presently flies away. For the same Reason, these sort of Herbs, being subjected to distillation, exhale almost an insipid water, and the dreggs of the Herbs remaining after distillation, is also insipid. Hence also some Herbs, which being green, abound with a sharp biting juice, being dried, lose very much of their acritude; as Scurvy-grass, Water-crelles, and Brooklime, &c.

2. Bitter Savour.

Secondly, The bitter Savour or Taste, such as is principally in Gall and Wormwood, seems to be made, for as much as the Particles of its Body are planted with forked Pricks, which digging into the Sensory, not deeply, but only on the Superficies, cause a sad or sorrowful Sense; just as if the sharp-pointed fruit of the Tease, should be sharply handled with ones hands. In Subjects indued with a bitter Savour, Salt, associated with Sulphur, and suffering an Adulstion with it, Predominates.

1. Which are bitter of their own Nature.

First, Subjects which exhibit this kind of Savour naturally, among Vegetables, are Wormwood, Southernwood, Centaury, Colocynthida, Agaric, Fumitory, and almost all Herbs which grow in dry and mountainy places; then Gums, and Concrete juices, as Myrrh, Aloes, Opium, Ammoniac, &c. Among Minerals they are not easily met with. The Excrements of living Creatures, as the Gall, and Dung, the Liquor contained in the Bladder of the Gall; and so the Skins of some Birds are bitter.

2. After what manner, the bitterness may be produced anew.

Secondly, As to the second, Things which draw bitterness anew, they are Compound-ed Liquors; if in Cooking they are burnt, or are made too thick by Evaporation; hence Soot is bitter, and whatever things suffer adulstion or burning. Sugared Aliments and sweet things are most easily Corrupted in the Stomach, and degenerate into a most highly bitter Humor.

3 By what means it is wont to be taken away, or altered.

Thirdly, As to the Third, a bitter Savour is most difficultly taken away, without the Destruction of the Subject, in which it is; as appears in Aloes, and Colocynthida, and Medicines prepared out of them. Yet New Beer, being something bitterish, by the boyling of Hops in it, grows sweet by clearing and a long fermentation: the reason of this we have shewed elsewhere. Further, Liquors, which grow bitter by reason of their Contracting an *Empyreuma* or burning to, if they be exposed for a long while in a moist Air, or distilled over again, mixed with Calcined Salt, they will partly lose their *Empyreuma*, or smatch of Fire, and bitterness.

3. Salt Savour.

3. Because Experience shews, that Salts for the most part do grow together, into many pointed, and diversly corner'd Figures, it is most likely, that the Salt favour is produced, when Particles of any Body, pointed with many Angles and Edges on all sides, do as it were cut into the Sensory, like as if little bits of broken Glais be strictly pressed in ones hand. In these Kind of Subjects, the Saline Principle excels the other Elements.

Salt things naturally.

First, Bodies naturally Salt, are scarce met with in the family of Vegetables, altho Plants and Herbs, almost all, owe their rise and growth to Salt. It is seen however that

that Sea Scurvigrass, and Capers have something of a salt Savour. Salt obtains the chief place among Minerals, and salitude or saltiness is chiefly eminent in Sea-Salt, in Salt that is dug up, Nitre, and Sal Gemmæ. The Excrements of Animals, to wit, the Dung, the Sweet, the Serum, are Salt; Blood also participates something of the Nature of Saltiness.

Secondly, Those Salts which are made by an artificial means, are the fixed Salts of Herbs, made by incineration or burning to Ashes: Compound Salts, to wit, Borax, Sal Ammoniac. A volatile Salt is drawn forth of Amber, Bones, Horns, and also out of the Blood of Animals, by Sublimation, 2. Things which are, so made by Art.

Thirdly, As to the Third, all natural Salts, if they be distilled often over again, pass into acetous or tart Liquors: The reason of which is, because these kind of Concretes suffer a divorce of the other Principles, by the fire, and so come more near to the Simple and Elementary Nature of Salt. Volatile Salts, at first white, if exposed to the Moisture of the Air, do melt into a reddish Liquor, not very Salt, and besides smelling like the stink of smok or foot; because the mixture being loosened by the moist Air, the Saline Particles, for that they are volatile, many of them fly away, but in the mean time, the Sulphureous Particles, before subjugated, get the Dominion. 3. By what means saltiness is wont to be taken away or altered.

Fourthly, The Acid, or sour, or tart Savour or Taste, seems to be made, when the Particles of any Body are four pointed or corner'd (to wit, which appear with a smooth and acute point, and with a sharp Body, like a wedge made into a bigger bulk) so that which way soever applied to the Sensory, they prick it, and by pressing it, something bind it up; and therefore they leave in it larger Incisions than any other Savour. This Kind of Savour, for the most part depends upon a fixed Salt, carried forth into a Flux. 4. The Acid or tart savour.

First, Bodies naturally acid or sower, are among Vegetables, Pomecitrons, Oringes, Lemons, Berberries, Sorrel, Tamarinds, &c. Among Minerals scarce any to be met with, as I remember, nor is it easily to be found among Animals, unless perhaps the Melancholly Juice, the ferments of the Stomach, and Spleen, the Pancreatic Juice, and also the fasting spittle of a Man, may be said to be something Acid. 1. Natural Acids.

Secondly, Made Acids, are Vinegar, and the Spirit of it, or the Liquor distilled: The Melanchollic Humor preternaturally begotten in the Body, which often like the Spirit of Vitriol, becomes Acid, and almost Corrosive. Vitriol, Salt, and Sulphur, being whole, and tasted in their solid substance, shew no kind of acidity, if they be made subject to Chymical Operation, send forth a Liquor highly acid; the reason of which was shewed but now. 2. Made Acids.

Thirdly, As to the Third, Chymists say, that acetous Spirits, to wit, of Sulphur, Salt, Vitriol, &c. by a long Digestion and Circulation, do grow sweet. All acetous Mineral Spirits, also distilled Vinegar, and the juice of Vegetables; if they dissolve any Body, by knawing or corroding it, as Corals, Pearls, or any Precious Stones, put away their acidness; because the Particles of the fluid Salt, in the acid Stagma or Menstruum, are fixed to the Alkali Salt in the mixture. Moreover, these Kinds of Spirits, and acetous Liquors, if they are mixed, either with Oil of Tartar, or with the fixed Salts of Herbs, loosened by Deliquium, loose their acidity. The Spirit of Vinegar being poured upon Salt of Tartar, and drawn off by distillation, becomes insipid. Spirit of Vitriol poured upon Quick-silver, and drawn off by distillation, putting away its acidity, acquires a taste like Allum; and if we may believe *Helmont*, passes by Coagulation into true Alum. Distilled Vinegar impregnated with the solution of *Minium*, or red Lead, grows wonderfully sweet. 3. By what means an Acid savour is wont to be taken away, or altered.

5. The Sower, austere, or binding or astringent Savour, arises in Bodies, whose Particles are stuffed with very many little Spears and Hooks, which in chewing, being rolled upon the Sensory, are fixed to it, and greatly draw together, and pull its Fibres; not much unlike, as if a Comb, which Cards Wool, should be drawn up and down upon the hands. In substances indued with an austere savour, a fixed Salt, enwrapped with the Particles of the earthy Element, predominates. 4. Austere or sower Taste.

First, Bodies naturally austere, among Vegetables, are the Fruit of the Medlar-Tree, of the Dog-Bryer, of the Cypress-Tree, Flowers of Pomegranat, Galls, Slows, Sumach, &c. Among Minerals Alum, Iron, Vitriol. Among living Creatures, or among their Parts, there is not as I remember, any austere savour to be met with. 1. Naturally austere things.

Secondly, Bodies Artificially produced, which have an austere, sower or rough savour, are all made Vitriols, to wit, the Vitriol of Silver, of Steel, of Tin, of Copper, &c. The reason of which is, because in these Minerals, the Saline Particles, are very much intangled with Terrene, and they continue in the same state, when they are drawn 2. Made austere savours.

drawn forth from their Substances, by the soluted Mixtion. Spirit of Vitriol being drawn from Mercury, by frequent Cohobations, acquires a Pontick or Aluminous Savour.

3. By what means an austere or rough Taste, is wont to be taken away, or altered.

Thirdly, As to the Instances, by which an austere, sower, or rough taste, may be taken away out of all Substances, it is to be observed, that Vitriol of every Kind, by long distillation and circulation with the Spirit made of Wine, grows sweet, and loses its astringent force. If waters impregnated with Vitriol, be poured into Oil of Tartar, there will be precipitated a certain thickish Matter wonderfully sweet. Steel, Tin, or Lead, being dissolved in Vinegar, and Coagulated by Evaporation, go into sweet Salts. Further, it is a common Experiment: If having before tasted Vitriol, you take the fume of Tobacco at your Mouth, the austere taste at first impressed on the Sense, is changed into a plainly honied sweetness; the reason of which is, because the Sea-salt Particles, such as are in Vitriol, being mingled with the Sulphureous, out of the burnt Tobacco, create a sweet Savour: from whence also we may Collect, that Sugar and Honey, are of a Sulphureous-saline Nature; which also clearly appears, by their distillation, for as much as they, like Salt Minerals, yield an Acid and very Corrosive Stagma.

VI. A sower Taste.

6. Of Kin to the austere, is the acerb or sower taste, the Particles of whose subject, are indued with little Tenters or Hooks, or Claws, but which are more dull and blunt, and with which they strike the Sensory, and stop up its little Pores, and being once fixed, they are not easily removed; whence a stupor or numbness in the Teeth and Palat is caused; not unlike Burdocks, which being fixed to the Skin, become troublesome, and are not easily shaken off. In acerb or sower biting Bodies, a fluid Salt, implicated with an earthy Matter, excels.

1. Bodies naturally acerb or sower.

First, Bodies naturally sower among Vegetables, are unripe Fruits; as Grapes, Pears, and Apples, and most of all Wildings, Crabs, or wild Apples, tho kept till they are mellow: also sower Herbs: Among Minerals, or Animals, there is nothing easily to be met with, that has a sower Taste.

2. Made sower things.

Secondly, Bodies that are made sower anew, are chiefly Wine and Beer, degenerating into a deadness, through Age or Thunder; also Leaven, or Bread too much leavened. Broths and Milk-meats, if they Contract a settlement and hoariness, become sower: because in all those Concretes disposed to Corruption, the Saline Particles being exalted, and tending towards a Flux, carry forth also earthy Particles involved with themselves.

3. By what means the sower Taste, is wont to be taken away, or altered.

Thirdly, As to the taking away of this Taste, we have observed, That sower Fruits do grow sweet, either by the goodness of the Air, and Sun; in sower Fruits brought to maturity: or by the goodness of the Ground or Soil, as when wild Apples translated to a good Soil grow sweet; the reason of either is, because the Spirituous and Sulphureous Particles before subjugated, at length Predominate over the Saline. If Wine degenerated into deadness, is impregnated with new Lees of *Tartar*, it shall recover its Vigor: The like happens, if a Can of good Wine be poured into a Vessel of sower Beer or Ale. Wine growing dead, if it be distilled, often yields a sweet Spirit, and in no less quantity, than if the Wine had been in its full strength: because the Spirits before subjugated in that Mixture, recover their Dominion by distillation.

VII. The sweet savour.

Seventhly, The sweet favour seems to be made, for as much as the Particles of any Body are so figured, into soft prickles, that they tickle the Sensory, with a soft rubbing, and from thence stir up a delightful Sense of Pleasure; like as if feathers were applied to the Sides, or the Soles of the Feet. In these the Saline Principle seems to be associated, with Sulphureous and Spirituous, and when they are, in like manner are carried forth.

1. What are naturally sweet.

First, Those which are naturally sweet, are among Vegetables, first Sugar, and Manna; then Cassia, ripe Fruits, Grapes, Raisins, some Roots, as Parsnips, &c. Among Animals, some ascribe Honey, but others more rightly, say that is sweet out of Plants, and gathered by Bees. Among Minerals nothing (that I know) hath naturally a sweet Savour.

2. Sweets prepared by Art.

Secondly, The things which have a sweet Taste, and are made by Art, are the Sugar of Lead, Salt of Steel, Lythargires, yea, and out of many other Bodies, Vinegar extracts a sweet Salt. Tasting Vitriol before-hand (as was said) and then taking a Pipe of Tobacco, the smoke grows sweet like Honey. In this, and in the former instances, whilst the Saline little darts grow to the Sulphureous Particles, or Saline of another Kind, both of them become more blunt. An *Alchalisat* Spirit, and the fixed Salt of any Body, being mixed, and circulated by a long digestion, acquire a sweetness. Barley soaked in Water, when it begins to sprout, and dried with a gentle fire, grows exceeding sweet: And Wheat in like manner also, if being wet, it sprouts yields a wonderfully sweet

Sweet Meal; the reason of which is, because by that Artifice, the Sulphureous and Spirituous Particles, overthrown by the Earthy, get their Liberty.

Thirdly, There are many Instances, by which sweetness is abolished; for all sweet things too much boiled, grow bitter. Sugar or Honey, by distillation, yield at first an insipid Phlegm, then sharp and burning Spirits; In the dead Head remaining after distillation, is a burning Salt, and an insipid Earth, and whatever is sweet perishes. Further, Sugar or Honey being mixed with a great quantity of Common Water, and distilled through a Bladder, yield a burning Water, like the Lees of Wine distilled after the same fashion. In both these, and in the following Instance, the additional sweetnesses are bruised, by the saline little darts, Sugar of Lead being fused by the fire, melts into meer Lead; if it be distilled in a Retort, if we may believe *Beguinus*, it will produce a burning and sweet smelling Spirit.

3. By what means sweetness is taken away, or altered.

8. The unctuous or oily savour, seems to be produced, when the Particles of any Body are very Spherical and round, which neither hawl, prick, nor tickle the Sensory, but only stroke it with a gentle and soft coming to it. In these, the Sulphureous Principle predominates.

VIII. An Oily Taste.

First, Bodies naturally Unctuous or oily, among Vegetables, are ripe Olives, the Turpentine-Tree. The Larix, and some sweet smelling Gums naturally sweating forth. Among Minerals, Asphaltum, Bitumen, Amber, Sperma Ceti, and some fat Earths, and Ochers: Of Animals, and their Parts, the Sewet, Marrow, and Fat.

1. In which it is by Nature.

Secondly, Unctuous things prepared by Art, are Butter, Cream, Oyls, press'd out of Fruits and Seeds, as Oyl of Nuts, of sweet Almonds, also Oyls drawn out of Seeds, Woods, Gums, and Resines by distillation.

2. In what things it is wont to be produced by Art.

Thirdly, Altho unctuousness is most difficultly taken away from the Subjects, yet it is wont to be less'n'd: for so Unctuous Bodies, if they grow stale, or are too much boiled, or otherways grow hot by shaking, losing their smoothness, become rank, and prick and dig the Sensory. Further, Sewet and Fat, if they be long exposed to a moist Air, contract a settlement, and become hoary, and then are resolved into Water, or a corrupt Earth. In this, and in the former instance, whil'st the mixture of the Body is resolved, some Sulphureous Particles fly away, in the mean time the remaining lose their Dominion.

3. How it is taken away or alter'd.

9. An insipid Savour or Taste, seems to be made, when the Particles of any Body, are indued with superficial little Darts, not at all sharp, but smooth and discharged; which enter not into the Pores of the Sensory, and no ways dig or hawl it. In these, the Principle either of Water, or Earth, predominate over the rest.

IX. An insipid Savour.

First, Bodies naturally insipid or tasteless, are Common Water, especially Rain Water, some cold Herbs, the raw white of an Egg, &c. Altho in the whole world, there is nothing insipid simply, yet Speech is wont to apply it to them things, in which some one of those Savours, are not eminently, which we have before recounted.

1. In what things it is by Nature.

Secondly, That Savory things may become Unsavory, the more acute Particles ought wholly to fly away, or be very much broken. Herbs long kept, also many more things, if they be distilled by a moderate heat, yield almost an insipid Liquor.

2. How it is wont to be produced.

Thirdly, Insipidness it self, sometimes is taken away; for insipid Water, if it stand long, that it putrifie, acquires a stink and mouldy Savour: The white of an Egg boiled hard, has something a sharp taste. In these kind of Instances, some active Elements, being before subjugated, get strength.

3. By what means it is taken away.

Besides these Kinds of simple Savours, which are as it were the Elements of the rest, there remain yet many Complications of these simple ones, as the Savours rehearsed are conjoyned one among another: And for as much as by the Wisdom of Nature, to satisfy all Palates, and by the Luxury of Art, that she might please the Throats of some, manifold mixtures of Savours have been produced, that almost nothing to be eaten, is found simple and without Sawce or Condiment. The several Compositions of these, is a thing almost impossible to enumerate; it shall suffice for the present, that we note some of the more noted Conjugations, and their Affections, as they are grateful or ingrateful to the Palate.

Compounded Savours.

The first Conjugation, and that most grateful to the Palate, is of acid and sweet, of which sort are generous Wine, Confections prepared out of Citron, Wood-Sorrel, Berberries, &c. Sugar'd things, and sharp things pick'd, with Sugar. Secondly, Sweet and Astringent, as also sweet and sower, are well Consociated: as in Marmalade of Quinces, Candied Bulloes, Cyder drunk with Sugar, &c. Thirdly, Sweet and oily yield a grateful Savour to the Palate, but that brings a nauseousness to the Stomach, as in Milk-meats, Sugar'd-meats, and Pastey-crust, &c. Fourthly, Sweet agrees not with biting, bitter, or salt Savour. Fifthly, nor doth a bitter Savour of it self, agree with any other: it is grateful to the Palate, well-tempered with the sweet. Sixthly, Salt-

Compositions of Savours, which are more or less grateful.

favour best agrees with the biting sharp, as in flesh seasoned with Salt and Pepper, it is an ingrateful Sawce with the oyle. Seventhly, The Acid, Astringent and Sower, are well associated with the sweet, not with the rest.

There are more Kinds of some other Compounded Savours, which we have no time now to recount. But there are in respect of the Taste, as the Compounded Tunes of Harmony in respect of Hearing, in both sensible not simple Species of one Kind, but are carried manifold, and variously Complicated to the Sensory. It now remains for us to pass from the Taste, the Object of which we have largely handled, to the other Species of the Senses.

C H A P. XIII.

Of the Sense of Smelling.

IT seems that the Smell is a more Excellent, and a little more Sublime Faculty, than either Tasting, or Touching; to wit, because its Object is more subtle, and comes to the Sensory, with a thinner Consistency: for there is no need to put upon the Organ, the more thick substance of the mixture; but it suffices, that the Effluvia's or Breath, sent from odorous Bodies, tho' at something a remote distance, be inspired into the Nostrils, together with the Air.

The use of the Smell, to discern Aliments as a distance.

Living Creatures are furnished with the Sense of Smelling for this end, to wit, that agreeable and wholesom Aliments may be known, and discerned from disagreeable and hurtful; for because it were an incongruous and dangerous thing, to take in presently into the Mouth, all things offered to be eaten, and to be examined by the Taste, lest perchance Venomous and Stinking things, carelessly taken in by the Palate, should bring loathing or hurt to it, the Smell examines first the thing at a distance, and refuses those rotten things, or guilty of any other very infestous quality, without receiving any hurt by the Contagion.

This is more excellent in Brutes than in Man.

This Kind of Primary use is seen more excellently in brute Animals, than in Man; for they by this Index only, most certainly know the Virtues of Herbs, and of other Bodies, before unknown, yea hunt out, and easily find their absent Food, tho' hidden from them, by the Smell. But that the Noses of Men are less quick or sagacious, it ought not (as some would have it) to be ascribed to the abuse of the Faculty, but the Cause lyes in the defect of the Organ it self; for this is not so accurately required for the distinction of Humane Food, where Reason and the Intellect are present: For that Reason the inferior Powers in Man, exist less perfect by Nature, that there might be a place left, for the exercise and dressing of the more superior.

The Organ of the Smell described.

As to what belongs to the Organ of Smelling, we have largely enough unfolded it in our Discourse of the Nerves; to wit, we have shewed, that within the Caverns of the Nostrils, are placed tubulated Membranes or like Pipes, which contain sensible Fibres, most thickly interwoven. Into these Membranes, very many small Nerves are sent from either Mamillary Process, passing thorow the holes of the Seive-like Bones; but those Mamillary Processes, as they are plainly soft Nerves, arise in the Medullary Trunk, nigh the streaked Bodies; wherefore, when the odorous steams, strike upon the Fibrous, and very sensible Membranes, forthwith an impression of the sensible thing, is carried by the passage of the Nerves into the Mamillary Processes, and from thence into the streaked Bodies.

Further, We have formerly declared, why the Smelling Nerves, divided without the Skull are harder, but united within it are not only softer, but also tubulated or like Pipes, and for the most part in Brutes, filled with clear Water: There is no need to repeat it here again, nor what we have declared there, concerning other Nerves, coming from the Fifth pair, and inserted also into the Organ of Smelling: Of which certainly the Office is, to cause a certain Sympathy and consent of action, between the Smell and Taste, and something also between the Sight and it.

Nerves of a several Kind, serve for Smelling.

I know some attribute the office of Smelling altogether to these Nerves, arising from the Fifth pair, denying it to the Mamillary Processes, and from hence they render a reason, not only of that consent, between the Nose and the Palate, from whence it comes to pass, that the same Objects are embraced or refused, but also, wherefore it happens, that one Sense being lost, that oftentimes the other perishes; to wit the Cause of this they

they say is nothing else, than that both Sensories do borrow the branches of their Nerves, from the same Trunk of the Fifth pair. But this Objection is easily overthrown, because the Nerves of a twofold Original, are bestowed not only on the Sensory of the Smell, but also of the Taste. For the Tongue receives more and greater Branches from the Ninth pair, than from the Maxillary Trunk of the Fifth pair: to wit, that if the Nerves of one Kind be obstructed, the Animal Function may be performed, by those of the other Kind. Concerning this then we may say, that the Principle Nerves serving to the Organ of Smelling, are derived from either Mamillary Process, also, that the Nerves on which the Sense of Tasting chiefly depends, are sent from the Ninth pair: Nevertheless, some secondary Nerves, or that are as it were taken in, are distributed to either Sensory, (as also to the Eye) far fetch'd from the Fifth pair: for this end, that there might be an affinity or mutual respect, between the Taste and the Smell, and between both and the Sight: hence therefore the Taste almost admits of no Object, unless that the Smell first approves of it: but both Faculties do require, that sensible things do first stand to the examination of the Eyes.

But that the loss of one of them, oftentimes brings in the defect of the other, as it is sometimes observed in a Pore, or Stopping of the Head, that losing the Smell, the Taste is lost also: the reason of it is, because either Sensory, being planted near, are both at once overthrown by the same ferous Matter, poured forth from the Blood, and apt to be too much stopped: for both the tubulated Membranes of the Nose, and the frame or substance of the Tongue it self, are made of a very rare, and as it were spongy Texture: wherefore, the Pores and Passages of either Organ, are wont to be overflowed by the ferous flood, and the sensible Fibres in both, in like manner to be obstructed, which happens, because when as the Nostrils and Tongue ought to be moistned, with a continual Humor, either of them are punished more grievously than other Parts, by the shower of the Serum issuing forth, so both on every light Cause, become obnoxious to the same Evil.

Hence the reason is bad, of that Consent, between the Smell and the Taste.

Why one being wanting, the other for the most part is Defective.

CHAP. XIV.

Of the Sense of Hearing.

After the Smell and Taste, of which we have already treated, we shall next speak of Hearing; which as to the use, is far more Excellent than the other Senses; for as much as by its help chiefly, Sciences and Learning are acquired, also by whose instinct, the Passions are excited; yea, and are wont to be governed and allayed; further as to Activity, this Sense is much more Efficacious, because having got a larger Sphear, perceives its Objects at a great distance, and admits not the sensible Species, unless brought in a more thin consistency: For that it is the Interest of living Creatures, to know some remote things by Contact, and often placed out of Sight, because they may be timely prevented, if they should be inimical and disagreeable, but if thought amicable, that they may be come to, and apprehended; the Hearing serves for either Intention, and by its sign, the Marks and Symbols of approaching Bodies are received afar off.

The Excellency of Hearing, as to Use and Activity.

Because the Hearing is always performed at a distance, and a sound comes often farther than the Effluvia's of a sounding Body, can be admitted; therefore, this Sense is supposed to be made even as Sight, by reason of a certain activity of the Medium it self, or by a Motion, and as it were a certain waving of little Bodies, which flow in it; so as the sounding Body, moves by its Vibration or shaking the Particles diffused in the intermediate space, and they being moved, at length affect the Sensory; but they conceive a certain Figure of their carrying forth, according to the Particles first agitated, and they propagate the same in others, and then in others, or move forward, as it were by undulation, and so the sound, still retaining the Character or Type of the first Impression, is continued even to the Ear.

Is performed at a distance; by reason of the Activity of the Medium.

Altho by the consent of all, the Air is said to be the Medium, that carries the sounds, yet this ought not to be understood of the whole Atmosphere of the Air, and Breaths; for neither is the audible Species poured forth, by the Motion of this most fluid Body, as it were by a waving of Waters; because this much sooner runs thorow, than the Body or Consistency of the whole Air is wont to be moved, and propagate its Fluctuation,

The Medium carrying sounds is the Air, but not the whole frame of it.

as may be discerned plainly by the successive blowing of the Winds, and bending of Trees, and the tops of Corn, which happens, because any sound, whether great or small, whether it comes with or against the wind, is carried to a certain place, always with an equal time; which would be otherwise if it obey'd the waving of the whole Air, or should depend upon that. Further, That the whole frame of the Air doth not wave, by reason of the transmission of the sound, appears by this; because, if a Lamp be held in a little Bell, whilst many other Bells being struck together, yield a mighty sound, its flame will hardly shake, much less will it be moved up and down hither and thither, by the moved Air.

Hence it follows, that some Sonorifick Particles, or Causing sounds, are diffused thorow the Air, and as they are more subtil than the little Bodies of the Air, and are indued with a more rapid Motion, the Transmission or Propagation of the sound, depends upon the peculiar motion and waving of these, made apart from the inclination of the whole Air. We have elsewhere shewn, in the texture of the Atoms of the Air, that there are contained Luminous or Nitrous Particles, by the inkindling, and by the most swift trajection, and reflection of these, Light, the appearances of Colours, and the Images of all things are produced. And besides these most thin and moveable Bodies, which seem to be of a certain fiery Nature, and interwoven with the Air, and by the private waving of which, the visible Objects are carried to the Organ, it is likely, that certain other Particles of another Kind, and those perhaps Saline, are diffused thorow the rare and most fluid Constitution of the Air, by which, whilst they are stricken and swiftly moved, and apt to be figured, according to the Idea's of Sounds, the Organ of the Hearing is also affected, and by this means receives the Impressions of sensible things. For it seems, that the Sound-causing little Bodies swimming in the Air, and interwoven with a certain Continuity in its Pores, and thickly set in its passages, are placed after that manner, that when a Motion is impressed, in any Portion of them, by the striking against a solid Body, they being agitated according to the Character of the Impressed Motion, move or shake others planted round about, and they again others, which are next to them, and so, when the same Motion is propagated round on every side, by a successive affection of the same Particles, (as when a Stone being cast into a smooth water, many little Circles beginning after one another, and unfolding themselves, create an Impression of the first stroke in every part) lesser types of the sound, and almost innumerable, take the place one of another, or fill up the room of the first Prototype sound, excited according to the solid Body, and from thence on every side waved, according to the Symbolical Particles successively moved; even after the same manner, as when the rayes of Light are reflected from an Opacous or shaddowy Body; for as much as they being sent at hand from every part of the Object, do meet together in a most thick Series of Cones, in every place, and so create infinite Images of the same thing, visible in all places: In like manner also, whilst the Sonorific Particles leap back from a solid Body, they cause the audible Species to be every where represented, according to the stroke there made upon them, in the whole Sphear of Vibration, whether by a like Contortion, or Gyration, or any other ways of Conformation in Motion, of the symbolar Particles.

But altho there are found Sonorific little Bodies something like the luminous, they are differenced notwithstanding in many things; for first of all, their Motion is much more slow than the luminous, which clearly appears from a Gun being discharged at a distance, for it is sometime after the flash reaches the Sight, that the report comes to the Ears. But the luminous Particles, tho they easily pass thorow the more solid Diaphanous Bodies, yet not thorow thick shaddowy or Opacous Bodies, tho they are made of a more thin or rare texture; or stick in the chinks: On the contrary the waving of a sound, does not so easily pass thorow Glass, but the same is often heard within a Chamber, that is impervious of Light, or where Light cannot enter. Hence it may be conjectur'd, that the rayes or beams of Light, how subtil and thin soever they be, are carried only in strait Lines; for whether they at first stream forth, or are broken in the altered Medium, or are reflected from an objected Body, they every where pass forward, and observe the Line of direction, and pass thorow the oblique and winding passages, not with a turning passage or going thorow; but the sounding Particles, being excited into Motion, insinuate themselves within the bending pores and blind holes, like the flowing of Waters; but these Kind of little Bodies, which are the Vehicles of sounds, I suspect to be of a Saline Nature, for this reason; because the Particles of this Element, are most of all Moveable and Active, next to the fiery and Nitrous Sulphureous; for it is seen, that Glass, and Metallick Bodies, which abound with very much Salt, being struck, yield a sound excelling all others: Also it makes for it, for as much as in a great Winter Frost, when the Atmosphere of the Air abounds with Saline Particles, a sound becomes more clear, and is carried farther.

The Sonorifick Particles seem to be Saline little Bodies, interwoven with the Air.

The Prototype of a sound, by and by stirs up innumerable Echoes.

How the Sonorifick Particles, differ from the luminous.

These are carried only in strait-lines, those in all.

Why they seem to be Saline.

So much concerning the Sonorifick Particles, as much as we are able to get by Conjecture; concerning their Nature, Subsistence, and wayes of carrying forth, or of waving. As to these, what at first was propounded, concerning the Sense of Hearing it self, there remains yet to be unfolded, by what means, and for what occasions, these Particles interwoven with the aerial Body, are stirred up by a sounding Body into Act; then how the same being moved affect the Sensory.

As to the former, there are infinite ways, whereby the aforesaid Particles are stirred up into Act, or by which sounds are wont to be produced; whatsoever percussion of a solid Body, yea and almost every vehement Compulsion of the Air, when resisted, yields a sound. There are very many Varieties of these, but the Universal, or at least the chief Causes of sounds, may be not improperly reduced to two ways of being made; to wit, either that a solid Body being struck, and so affected with a Vibration or shaking, drives together the Air, and with it the Sonorific Particles; and the stroke being most swiftly repeated, causes them to shake or to wave; Or secondly, the Air, and with it the Sonorific Particles, being driven into a more narrow space, whilst they go forth by Compression, are struck against the solid Body, and are driven by it into a vibration or shaking. By reason of the former way, all solid Bodies, struck by solids, yea and hollow Metallick Bodies, a Drum, the strings of an Harp, and other Musical Instruments, furnished with strings, when they are stroke, yield a sound; in all which, a vibration being excited from the stroke and shaking Body, and impressed on the Sonorific Particles, is the whole Cause of every produced sound, or of long Continuance, and also tho' but of a minutes durance or founding. For both Metals, also Stones, and Wood, and other solids, being struck, make the Air to tremble and yield vibrations or shakings, in some measure like Bells, and the strings of an Harp: Wherefore, when by the Finger or any soft Body being lay'd upon them, that shaking is stopt, presently the sound is intercepted. In the latter Rank, to wit, where the Air is compelled or straitened, whilst it strives for liberty, striking against the solid Body, produces a sound, ought to be placed sounds, which are excited by speaking, wind Instruments, letting off of Guns, and the passage of winds thorow strait places.

As it thus appears, by what means the Sonorific Particles are stirred up into act, there remains a no less difficulty, concerning the way, whereby they affect the Organ of Hearing, that by it a Feeling or Sensation is produced. We shewed before, that by reason of the aforesaid Particles being interwoven with the Air, and successively moved with a continued Series, the Impression of a sound is diffused every where, into a Round or Orb; Further, we Note, that if their waving promotion meet with any stop, the same being thereby reflected, or forced by another thing, it in like manner affects other Particles, wherever met with, and so is still broken into more sounds, which are carried hither and thither into every part; which is the reason that sounds climb over Houses, being sent forth at hand, return back, enter into every hole and chink, and easily propagate themselves into secret places and recesses, where light cannot enter: In the mean time, all sounds, both direct and reflected, and which are diverted aside, and which become less and numerous, from greater refracted and divided sounds, and variously result, exactly bear the Character of the Prototype of the same sound: Hence it comes to pass, that the Hearing being planted in every place, it receives the same sound in specie, and oftentimes articulate.

But as to the second Proposition, for the manner of doing, whereby by the Sense of Hearing is performed, we think that first of all, the Structure of the Organ it self ought to be considered; in which, that which being utmost receives the first strokes of the sound is the Ear: This part being largely spread, by degrees grows narrow, till the hole made more narrow, leads inward to the den of the Ear. The use of the Ear is to gather together the Sonorific Particles, coming to it spread abroad and dispersed, and so many; that the Impression may be made more sensible, to direct it inwards towards the Sensory. In imitation of this natural Instrument, are wont to be made the Artificial whispering Instruments, which like a Pipe or Trumpet, by introducing many Sonorifick Particles, supplies the defect of Hearing. The Ears in most Beasts are moveable, that they might be turned every way, to any noise, and might receive a more certain notice of the sound; otherways uncertain; yea, it is probable, that mens Ears are moveable by Nature, because they have hanging Muscles, but that by the continual use of the Head-bands, which they make use of in Infants, this faculty is taken from them.

After the Ears, follows the Cave or Den of the Ear, leading obliquely towards the inward Parts. Whilst the Sonorifick Particles pass thorow the turning and winding passages of this, the same, by reason of the frequent strikings and refractions against the sides, encrease the sensible Species; after the same manner, as is seen in Corners, and wreathed Instruments, by which the sound is very much strengthen'd. Also this further

By what means
Sonorifick Particles
are stirred up into Act

Or how sound is
caused, and
stop'd.

The Motions, or
spreadings of an
excited sound.

The Organ of
the Hearing de-
scribed.

The Ear and
its uses.

The Den of the
Ear and its
uses.

further appears, for that the Hollows or Cloysters in some Walls, are wont to be so artificially made, that a low Voice whisper'd, being transmitted by the same, may be heard at a great distance. Moreover, the aforesaid Den of the Ear ought to be oblique and turning, that its more inward parts might be defended from the easie meeting with of Injuries; and for this reason, there is there placed a bitter Wax, sweat forth from the little Arteries; so that if any little living Creatures, should by chance creep into the Ear, they might be there entangled, or at least driven away by the Bitterness, as Worms by Gall. This yellow stuff without doubt is of the same Nature with that which is destinated for the Bladder of the Gall.

The Drum.

Nigh to the most intimate recess of this Den, a thin Membrane is placed, with a Circular Bone, fitted to the same, which wholly shuts up the Cavity of the Ear, and distinguishes the Interior Cloyster from the Exterior; so that the Impulse of the sound, shaking this Membrane like a Drum, delivers the Impression to the Sonorifick Particles planted beyond, and they being moved, affect the Fibres, with the Auditory or Hearing Nerve.

Three little Bones about the Drum, with the Muscle and Ligament.
The Hammer.

About this Membrane, three little Bones, with a Muscle and Ligament, and some other Parts, are placed; from which being thorowly view'd, and truly consider'd, the Use and Offices of the Drum, and its whole Appendix, are clearly learnt. The first of these is a little smooth Bone, lying upon the more inward part of the Drum, and sticking to it, this is commonly called the Hammer, either from its figure, or rather because it is thought to strike and knock against the Drum; when indeed, this Bone affixed to the Bos or Shield of the Membrane, strikes not against it, but bends inward, and draws it with it. Also, besides this little Bone, is united with many other little Bodies, for the Tendon of the Muscle, which lifts it up, and bends it inward, is inserted into its sharp Process, and the other more blunt extremity of the Hammer, is ingrafted with the Anvil, so that the Hammer may be able to move round about upon the Anvil. This Anvil is a Bone almost round, which leaning into the Cavity, hath two proper Shanks, one whereof being fixed to the Cartilage, is fastned by the same to the stony Bone; but the other shank of the Anvil is joyned by the Cartilage to a third Bone, called the Stirrop; so that the Anvil being joyned by the Cartilage to the Stirrop, is also moveable; and the two shanks of the Stirrop are affixed to the Ligament, and by it stick to the stony Bone. As to the Muscle, which lifts up the Hammer, (altho at first sight only its Tendon appears) if it be farther searched, it is seen to be big enough and round, planted in its proper Cavity, the Tendon of which is inserted into the sharp process of the Hammer, and lifting it up, and drawing it inwards, bends and distends the Drum within; notwithstanding, lest this Muscle (if it should happen to be pulled) should be brought too near to the Drum, a smooth a transverse Ligament, is placed before the acute process of the Hammer, which strictly leans on the Hammer, and binds it; and lest it should be drawn beyond measure, by the Muscle, contains it in its due site.

The Anvil.

The Stirrop.

The Muscle.

The Ligament.

The use of the Drum.

From these it is easily to be understood, what use these Parts are for, which we described: For it is seen, that the Drum is the Preliminary, and as it were Preparatory Instrument of Hearing, which receiving the first Impression of the sound, or sensible Species, directs them in due proportion, and apt conformity towards the Sensory, which is placed more inward: It performs the like office in respect of the Hearing, as the Coats of the Eye, constituting the Pupil or Apple, in respect of the Sight; either Membrane break and as it were soften the sensible Species, and deliver them to the Sensory in proportion, to which if they should come naked, they might hurt or destroy easily its more thin Constitution. Indeed the Drum does not hear, but contributes to the better and safer hearing. If this Part should be destroyed, the Sense may be still continued for a while, tho after a rude manner: because it appeared by an Experiment made in a Dog, that having boared both the Drums of his Ears, Hearing remained still for a time, which after three Months wholly ceased, to wit, after the Constitution or Crasis of the Sensory, suffering by outward Injuries, was overturned.

The Drum hears not.

The use of the little Bones, as also of the Muscle, and Ligament.

But that the Drum might truly perform this sort of office of a Porter about the Hearing, its stretching forth ought to be bound or loosned, as occasion serves, to wit, as the Pupil of the Eye is wont, as the matter requires, to be either contracted or dilated. Wherefore, certain Machines or Braces, like to a Drum of War, are appointed for the Drum of the Ear, which render its Superficies sometimes more stiff, and sometimes more loose: For this, the three aforesaid little Bones, with the Muscle and Ligament, effect. The Muscle lifting up the Hammer, whilst it Contracts it self, the Drum is distended, when it remits its endeavour, that is suffer'd to be loosned; but the Ligament moderates the action of the Muscle, and hinders, lest the Hammer being too much drawn up, should distend the Drum till it break: But that the Rod or Beam (which is a part of the hammer) affixed to the Membrane, and drawing it to the Motion of the Muscle, is not

one Bone, but three little Bones joynted in one another; the reason is, both that the drawing of the Membrane be not too hard and stiff, but with a certain ceasing and flexibility of the Beam, without which the Drum, for that it is a most thin little skin, would be in danger to be broken; also, that by so many joyntings of the Beam, the motion of drawing might be determined, as occasion serves, into various parts, hither and thither: This part hath almost the same use as the *Hyodes* Bone, which is made of many little Bones joynted together.

As to the Action of the Muscle lifting up the Hammer, it seems that it is chiefly involuntary, and that 'tis acted by the instinct of Nature, according to the indigencies of the Bone; for when a sound too vehement strikes the Ears, this Muscle remits its endeavour, that the sensible thing might strike more strongly the loosened Drum; but if a smaller or duller sound enters, the Muscle being contracted, distends the Drum, that the Impression otherways obscure may become more sensible: If that many voices and confused sounds approach the Ears, it is probable, that the Drum disposes the Species brought to it, after a diverse manner of Action, and as it were admits them in, with a certain Choice.

The involuntary Action of this Muscle.

Altho Hearing is not made by the Drum, as the proper Organ of Sense, yet this so much depends upon that, that oftentimes the Action of the Drum being hurt or hinder'd, a privation or a diminution of that Sense follows. For we meet with a certain kind of Deafness, in which those affected, seem wholly to want the Sense of Hearing, yet as soon as a great noise, as of great Guns, Bells, or Drums, is made near to the Ears, they distinctly understand the speeches of the by-standers, but this great noise ceasing, they presently grow deaf again. I heard from a Credible Person, that he once knew a Woman, tho she were Deaf, yet so long as a Drum was beaten within her Chamber, she heard every word perfectly; wherefore her Husband kept a Drummer on purpose for his Servant, that by that means he might have some converse with his Wife. Also I was told of another Deaf Person, who living near a Ring of Bells, as often as they all rung out, he could easily hear any word, and not else. Without doubt the reason of these is, that the Drum of it self being continually loose, by the impulse of a more vehement sound, is compelled to its due tensity or stretching forth, by which it might in some measure be able to perform its office. But we will proceed in Order, to the other Parts of the auditory Organ.

Deafness sometimes proceeds from the looseness of the Drum.

Behind the Drum, the Den or Cavity subsists, in which the Ancients placed the implanted Air, which received the impressed sound from the Drum: which thing indeed is not unlikely; for, because the waving of the sound ought to be conveyed still further towards the Sensory, it seems that the Sonorifick Particles, which are their Vehicle, are contained within this Den; and because it is needful, that the Sonorific Particles, included in this Den, should be in some measure consumed; therefore from this hidden place, there lyes an open passage into the Palate; but yet after that manner, that little doors being placed in its upper part, it admits the Air fetch'd from the Palate, as often as there is need; but the same being admitted into the Den of the Ear, its passage out by the same way is hindered. By reason of this Channel, it is, that the sound becomes rather sensible to the Palate of some deaf People, than to their Ears; to wit, when the office of the Drum is spoiled, the sensible Impression is carried, in some measure, to the Sensory, by this other way.

The Cavern containing the Air, placed behind the Drum.

From this Den a Passage into the Palate.

But from the aforesaid Den, placed behind the Drum, another passage leads towards that part, which is properly the Organ of Hearing; to wit, in the extrem side of that Cavern, before-mentioned, there is a door, or certain round hole, covered with a thin Membrane, commonly called the Window, and beyond that hole, to wit, in the end or sharp process of the stony Bone, is the Shell contained: from whence we may think very well, that the impression of the sound brought through its next Chamber from the Drum, is from thence propagated, by an impulse made above the Window, into the Shell.

Another Passage from this Den (called the Navel hole, or the Window) leading into the Shell.

But the Body of the Shell is an admirable Structure, which being framed in a peculiar recess of the stony Bone, is called by some the Labyrinth, by others the Shell; because its passage or hollownes, after the manner of a Snails shell, is carried about with a turning or spiral Convolution. There are two parts of this, or rather there are two Shells, the former being nigh the chief Oval hole, is less'n'd by degrees, from the Spire, or more broad Capacity, and ends in a very little one, then from the end of this, another Shell, beginning with a very small spire, is enlarged by degrees, in its progress, and its extremity opens with a greater aperture, into another Den or Chamber, placed beyond, with an open mouth; this is without any Membrane covering it.

The Description of the Shell.

As to the Shell, the use of it seems to be, that the audible Species being brought thoro such turning and winding Labyrinths, and so receiving an augmentation by reflection, and manifold refraction, it may become more clear and sensible; then further, that every

The Use of it.

Impression, carried about by this winding and very narrow way, may come more distinct to the Sensory : because by this means, care is taken, that many confused Species together, may not be brought in. After the example and similitude of this Shell, artificial Caverns, and arch'd Meanders, are wont to be framed by Architects, for the increasing of sounds, and for the distinct propagating of them to a wonderful distance. Further, there is another use of the Shell, no less noted, to wit, that the audible Species may be impressed on the Fibres and the ends of the sensible Nerves, inserted in this place, not at once or at large, but by little and little, and as it were in a just proportion and dimension.

The auditory Nerves.

Two Processes of the softer auditory Nerve, one tends into the next Chamber of the Shell.

The other into the Shell it self.

We have elsewhere discoursed concerning the Hearing Nerves, which receive the sensible Species, and carry it towards the Common Sensory, and we shewed, that the softer process of either of the seventh pair, is destinated to this office ; wherefore the end of this Nerve is terminated in the nearest Chamber of the Shell, whence it is manifest, that the sensible Impression, being disposed from the Shell into this Chamber, is conveyed thence towards the Head, by the passage of this Nerve. But moreover (which we took not notice of before) it is observ'd, that this softer auditory process, is cleft into two branches : one whereof is inserted after the manner we have here described, into the aforesaid Chamber ; but the other, no less noted branch, is implanted in the Shell it self, about the mid'st of it, or nigh to the meeting of either Labyrinth ; so that this branch seems to receive the Depositum of the foremost Shell, and the other aforesaid of the latter Shell.

The extremity of either auditory Nerve, which are implanted about the end of either Shell, ending in slender thrids, seems to cover over the places of Insertions, every where with Nervous Fibres spread abroad, as it were into a certain little Membrane ; whence it follows, that towards the end of either shell, the proper Sensory of Hearing ought to be placed ; for there is the Sense, where the Nerve receiving the Idea of Sensation, is implanted ; but as the Shell is twofold, and that in like manner there is a double insertion of the forked auditory Nerve, it follows, that in either Ear, there is a twofold Organ of Hearing : but for what use this is so made, does not plainly appear.

For what Uses it is so made.

That we may give our Conjecture concerning these, perhaps there is need for the audible Species, to be carried toward the common Sensory, that its passage may be the more certain, and that the perception of the sensible thing, may be put out of doubt ; but we rather think, that this Sensory is made double, that when oftentimes the Idea's of sounds ought to be heard and perceived together, some might pass this way, and others that way, without Confusion. For it is observ'd, that the Hearing, not only as the other Senses, receives many objects together ; and by and by whether united or confused, comprehends them, by the same act of the Sense ; but moreover, this faculty in the time of Hearing, so distinguishes things, often divers. admitted together at the Ears, that it seems to hear one after another : It ordinarily happen'd, that in a confused multitude of voices and sounds, that I have my self taken notice to have heard the peculiar voice of a certain Man, and then a little after, I have known that I have heard, at the same time, some other words of another Man, that I did not perceive before ; the reason of which is, that this sound, being received together with that, reached not at the same instant to the Common Sensory : wherefore, we may believe, that the sensible Species of the former sound, passing thorow only one Shell, is by and by conveyed, by the first branch of the auditory Nerve, sooner to the Sensory, but the other sensible Species, because it could not be carried with it together by the same Nerve ; therefore it is carried by a winding about thorow the second Shell, and at length to the second branch of the auditory Nerve, and so coming later to the Common Sensory, is afterwards perceived.

A rehearsal of the Parts, which serve for Hearing.

Thus much concerning the Instrument of Hearing, and its parts, both Preparatory, and chiefly Organical ; of the first sort are the Ear, the outward Den, the Drum, and what belongs to it, the interior Den, and its two doors ; to wit, one admitting inward thorow the door from the palate, the other emitting thorow the oval hole : Of the latter sort are, The twofold Shell, with both the Branches of the auditory or hearing Nerves. Both the Parts, for the most part, are of like make in all Animals ; the greatest mark of difference is, as to their Ears, which are variously figured, partly for ornament sake, and partly for a diverse use in respect of the inward Den, placed behind the Drum : for this is framed in a Calf, Sheep, and perhaps some other Animals, of spongy Bones, and long Caverns, having recesses in themselves ; In Man, and in Doggs, and perhaps in many others, who are indued with a more acute Hearing, this Cavity is shut up with a round Bone, having a plain Superficies within, whence the sound is reflected more strongly into the Shell ; but in a Calf, and Sheep, the sound seems to be much broken and debilitated, in these bony Caverns ; wherefore, these Animals are said to have slow Ears ; for it is not expedient, for such destinated for to be fatted for Food, to hear acutely, that they might be affrighted and provoked by every Noise.

How they differ in Man, and in some four-footed Beasts.

CHAP. XV.

Of the Sight.

IF there be any strife for Dignity among the Senses, the Palm is given, almost by the consent of all, to Seeing, as the most noble Power; because this faculty apprehends things at a great distance, under a most subtil Figure, by a most clear perception, and with great delight; so this Sense acts, that is next in virtue to the Eternal and Immaterial Soul: To wit, it views and measures both Heaven and Earth in a Moment, and brings within its embraces whatever Bodies are situated in either, and that are far remote from our touch.

The Sight is the most noble Sense.

'Tis needful that Seeing should be so performed at a distance, that visible things might diffuse, and every where propagate themselves by their Images far and wide; so that where-ever the Eye is stop'd, the Images of some Bodies objected are met with. But after what manner this is done, and by what means the sensible Species is received by the Organ, ought a little more deeply to be inquired into.

It acts at a distance by reason of the Species of visible things diffused afar off.

As to the first, altho Light, Colours, and Images, are wont to be moved from place to place, and by the help of Glasses to be transferred hither and thither, and indeed affect the Eye with their Motion, yet it is manifest, that they are not meer Qualities, but certain Bodies, or consist of most thin little Bodies. These three are very much of Kin among themselves, and differ little or nothing one from another, as to their Essence; for indeed, the same Effluvia's or little Bodies, for as much as they proceed from a lucid Body, are called Light, for that they are reflected from an opacous or shaddy Body, under a certain placing and meeting together, cause the Image of the Object; and for as much as it happens, the same rays of Light, in their reflection, are broken or turned in, from a dark or opacous Body, after this or that manner, they cause the Appearance of this or that Colour to be represented.

Light, Colours, and Images, are the same substance.

As to the Rays themselves, or the passing thorow of little Bodies, the irradiation or beaming forth of which, shews the Representations either of Light, Colour, or Images, it is much disputed; whether they are only Effluvia's, darted from a lucid Body, and re-percussed in their going forth, and reflected variously here and there, as is asserted by *Gassendus*, and some others; or whether Particles being sent forth from a lucid Body, move other the like Particles, implanted in the Air, and as it were by inkindling them render them luminous, and these at length others, and so a diffusion on every side of Light, or Images, is propagated as it were by a certain waving.

What the Rays are, which cause the visible Species.

Whether they are Particles, streaming from a lucid Body.

Against the former Opinion 'tis objected, that it seems impossible, that the Effluvia's of flame or fire, should be able to be unfolded so suddenly, and dilated or spread abroad to an immensity: for when a Candle being lighted, immediately the whole Chamber is illuminated, it can scarce be conceived, that the fiery little Bodies of that flame, should break forth so suddenly and so thick, that they should fill, in the twink of an Eye, so vast a space. For indeed, the new Motions and Increase of an inkindled flame, are more slow and perceivable to the Sight it self; how therefore can we imagine, the motion or dilatation of Light, for that this is but only a thinner flame, to be so incredibly swift? Besides, when in the same instant, in which a Light placed in an eminent place is inkindled, it is beheld at many Miles distance, none can think, that these Particles sent forth from it, can be able to be carried so long a space, at least in so short a time; but truly, how should it be supposed, that these Effluvia's streaming from a small Light, should presently possess the whole Hemispher? Because the light enkindled in the whole Region round about, meets with the Eye where-ever placed. Besides, when from a Glow-worm, a certain kind of Light or fire shines in the dark, and is perceived at a distance; if this apparition should be made by reason of the fiery little Bodies streaming from this little Creature, whence I pray is so much fiery Tinder supplied? From these and some other Reasons, we are led to believe, that when the Medium is so soon inlightened, besides the Effluvia darted from the lucid Body, others also interwoven with, and implanted in the Air, being moved by those Effluvia's, and as it were inkindled, contribute to illumination.

Or rather, whether inkindled Particles of Nitro-sulphureous Air.

For the Explanation of this, hither ought to be referred what hath formerly been said concerning the Nature of fire and flame; to wit, we have shewed, that with the Sulphureous Particles, breaking forth from an inflameable Body, others Nitrous do come from the Air, and are inkindled with them, and so do not constitute fire or flame, unless both

Which Opinion seems most likely.

*The differences
of flame, and
light.*

are joyntly inkindled. The like reason may be given of Light, and consequently of Images, and Colours, most swiftly produced from Flame and Light : to wit, some Sulphureous Particles being carried beyond the compass of the Flame, joyn together with others Nitrous, and easily inkindled, and so produce a most thin Flame, viz. Light. For indeed, from an inkindled fire, many sulphureous Particles presently streaming forth thickly, lay hold on more, or at least the like Nitrous, and so constitute a more thick and almost dark Flame ; this, for that it is fat and thick, passes not thorow the Pores of Glass, and tho it is apt of its own Nature, to be carried in direct lines, yet it is wont to be bent hither and thither, and to be made crooked by the blasts of Wind, yea to be carried within Tubes or hollow Pipes very crooked. But Light is made of fewer and more subtil sulphureous Particles, which passing beyond the first inkindling, fly away round about far and wide, and so meeting every where with many Nitrous, constitute a most thin white Flame, and without heat ; this easily passes thorow Glass, and all clear Bodies : Its beams, for as much as they consist of more Nitrous than Sulphureous little Bodies, are carried only in strait lines, so that tho they are wont ordinarily to be broken or reflected, yet they cannot be made crooked.

*Lucid Bodies,
are either Cœ-
lestial,*

*Or Sublunary,
in the light of
which, we ob-
serve three mea-
sures.*

Subjects emitting fiery and luciferous Particles, among the Cœlestials are the Sun, and Stars ; but among the Sublunaries, whatsoever are filled with Sulphur, are apt to flame forth. Concerning the Sun we note, that wherever it may be seen in the Earth, it diffuses a clear Light, so do not the fixed Stars, because they are at too great a distance from the Globe of the Earth. As to the Sublunary Lights, we shall observe, as it were three Stadia or measures, in which they have their Beams after a diverse way ; to wit, in the first place, the Flame consists within the compass of a lucid Body, which is both hot, and disperses heat every where round about, to what is near, not only by the open Air, but also by all Bodies, to wit, both diaphanous and dark, solid or rare. Secondly, In the extream Border of the Flame succeeds the Sphear of Light, which being more illustrious near the Flame, is by degrees attenuated, till it ends in plain darkness. Beyond the bound of the Light, the lucid Body propagates its Image or likeness a great way ; for a Candle being inkindled, is beheld for many Miles in the dark : The trajection of which seems to be made, by reason of the Impression made on the Nitrous Particles, diffused thorow the Air ; wherefore when the accension ends, about the border of Light, yet from thence it at a long distance transmits every way an Idea of the Flame or Light, by a most swift undulation or waving of them being moved.

*Wherefore light,
either reflected,
or refracted,
goes forward
only in strait
lines.*

The trajection or the passing thorow of the Rays of Light, whether the same be direct, or reflected, or broken, goes forward (as we hinted but now) only in strait lines, and not in oblique, or turning about : the reason of which is, because the fiery or light-carrying Particles, how subtil or active soever they be, most easily pass thorow, and without any impediment, the Pores and Passages of the Air, and follow not its Course or Torrent. Further, as the fiery Particles (as it seems) are only of a Spherical Figure, and of a very small bulk, their irradiation or beaming forth, is made only in direct or strait lines : to wit, because, when the little Globes breaking forth from any fire, stream thickly forth on every side, and that the former are joynted to the latter, it is necessary, that they should be driven forward to the side, still without any declination : for as much as if Pricks be driven one from another, their progress create a strait line.

*Light can pass
thorow a Cham-
ber, in the mean
time, not to be
perceived.*

But hence it happens, that Light does not as a Sound or Odors, pass thorow winding chinks, or passages of holes ; yea, neither do we perceive the Sun or Stars, nor the Beams of a Sublunary Light, unless the same meet the Eye direct, or reflected, or refracted ; for it may be made, that an handful of the Beams of Light, may pass thorow a Chamber whole, that in the mean time the Eye, placed in it, may perceive nothing of brightness. For Example, Let there be bored in one end of the Chamber a small hole, and in the other opposite a greater, in the space then without the less hole ; if a Light or Lamp be placed, it shall illuminate that space placed without the greater hole, in the mean time, the Chamber between which the Beams of the same Light passes thorow, shall be seen dark : The reason of which is, because the Beams, passing thorow, for that they neither unfold themselves abroad, nor are reflected, meet not the Eye placed without the line, and therefore create no appearance of Light : also, for that reason it is, that when we look up from the bottom of a Pit, at Noon day, it is as if it were quite night, and we behold clearly the Stars themselves, without any appearance of Light.

*Light Primary,
or Secondary.*

But altho Light is devolved into every Part round about, not by a waving fluctuation, but proceeds with only strait rays or strokes, yet these rays stream forth so thickly, and being reflected from Bodies after a manifold way, meet one another, mutually joyn, and are sent together, with so thick a Series, that not rarely almost the whole Pores or Passages of the Air, are possessed by them, either direct, or refracted, or reflected. Wherefore

fore Light is wont to be distinguished, either that which is Primary, which proceeds immediately from Light ; Or Secondary, which is reflected from Objects, which sort of reflection of it, is wont to be many time reiterated.

Concerning the Primary Light we observe, that its Beams, from whatever Light they proceed, either Cœlestial or Sublunary, are almost the same ; hence it is, when many of a diverse Original are mixed together, they are not easily known asunder, because the lesser Light is always obscured by the greater : But the Secondary Light, or Beams reflected from solid Bodies, that besides, by redoubling the illumination, they render the Medium more clear ; also, according as they are variously modified from Objects, in their being reflected, they create the appearances of Images and Colours.

Concerning the Nature of Colours and Images, as the Philosophers of every Age, have disputed it, and that divers Opinions are delivered, by several Authors, none as I think has discours'd more ingeniously, or more like to Truth about this, than the famous *Gassendus* ; wherefore, if it may be lawful to Plow with his Heifer, we will add the whole Matter in a short summary.

Every visible thing or Body is lucid, or illustrated from Light ; That, is beheld by its proper Light, and by direct Rays ; This by another, and by reflected Beams ; but the Medium is not seen purely perspicuous, because it emits not proper Beams, nor reflects others, by reason of its thinness. Concerning a lucid Body we observe, that this shining clearly and without any Impediment, appears under a bright form ; wherefore Light in a fountain, is of a white shining Colour, but that it alters its Colour, it is nothing else than the intermixture made in its Beams, of shadows or darkneses ; but this is made either by reason of little Bodies, being between in the Medium, which avert some Beams : So the Sun seems red in the Horizon, by reason of Vapours which intercept many Beams, or the whiteness of a lucid Body degenerates, by reason of Particles, not lucid, interspersed within its Body, and with the Beams themselves ; so when Soot and Smoke stream forth with the inkindled Light, the Light becomes more red or darkish.

As a lucid, so also an illustrated Body, appears not pure, but altered, under the form of whiteness ; for because the Rays are not all reflected, but by reason of the inequalities of the Superficies, some are wholly immersed, and others averted, therefore not a pure whiteness, but another Colour is seen in it. Indeed, as an illustrated Body is more smooth and polite, that it may reflect many Beams, the more bright and shining it appears, as is manifest by a Looking-Glass ; but the more rough and rugged the Superficies is, that it hides many Beams, or averts them, the more the form of whiteness degenerates.

Concerning the unequal Superficies of illustrated Bodies, two as it were extream dispositions are to be observed, by which the proper whiteness of reflected Light is very much altered ; for either the Superficies of a Body is render'd unequal, by many Swellings up, as it were little hills or bubbles thick set, by which, tho many Rays are turned aside, yet by the divers faces of the little hills or risings, Beams are reflected in a more thick heap, than from a smoothed plane, therefore there is made a white Colour, coming near to the whiteness it self of Light. Or Secondly, The Superficies of an illustrated Body, gapes with very many Ditches or Pits, as it were Dens, in which the Rays entring, are wholly drowned, and are not reflected at all, from whence comes the black Colour, or a privation of white : after this manner, the two extream kinds of Colours, to wit, white and black, seem to be produced.

But as to the other intermediate Colours, besides the Light, being reflected with little shadows, and variously intermixt with darkness, we ought to suppose, the divers manner of refraction of its Beams, to be partly also the Cause ; of which there is a certain sign, for that in a Triangular Glass called the *Prism*, the Beams being refracted diversly, falling upon this or that Angle, are wont to shew Green, or Purple, or Yellow, or a Colour of some other Kind : In like manner we may believe, that also the Rays of Light being variously broken and turned inwards, in their reflection from an illustrated Body, and so cut and mixt together among themselves, do produce all manner of differences of Colours. This is not a place here to treat of the particular Splendor of every Colour, and the manner of their Production, but it may suffice, that we have mentioned in general the reason of their appearances.

But these things concerning the Nature of a visible Object, and the manner of its trajection, being thus premised, it behoves us next to shew, after what way Sight or Seeing is performed, by reason of the sensible Species being so sent from the Object, and received by the Organ. This commonly, and not improperly, is wont to be declared by the example of a Burning-Glass, which like a little Window is fixed before an hole made in the Wall of a shut up and dark Chamber ; Because, from the Bodies every where

The differences of these.

The reasons of Colours and Images unfolded.

According to Gassendus, Every Body is either lucid, or illustrated.

The Colour of a Light Body is white.

Which is variously altered, by reason of interspersed Clouds.

An illustrated Body, as it is either smooth or rough, reflects Beams variously, and therefore produces various Colours.

The variety of Colours also depends, upon the refraction of Beams.

A Burning-glass placed before a dark Chamber, declares how Sight is made.

where brought before that hole, the Rays of Light being reflected, meet together in the Glafs, and in that passage cutting one another, spread themselves at last within the Chamber, and so upon a white Wall within, represent a Landschap of the whole visible Hemisphere. The Conformation of the Eye it self is much after the same manner, for in it may be discovered, both the shut up Chamber, and humors as it were Dioptric Glasses, which gather together the Beams, and break them after a manifold way, all artificially disposed; and lastly, as it were a whited wall, viz. the *Retine Coat*, or the Membrane of the Eye, on which the Images of visible things are Impressed.

The Organs of the Sight, are the Eyes, and the Optick Nerves.

Indeed the Eyes, and Optick Nerves belonging to them, perform the whole Act of Seeing; within the Cloysters of these, the Images of all visible things are formally painted, and by the passage of these, to wit, the Nerves, the perception of the Images there drawn is conveyed to the common Sensory: It now remains, that we consider both the Fabrick in either Organ, and the particular uses of the several Parts.

How the frame of the Eye, is fitted for Seeing.

As to the Frame and offices of the Eye, for the performing of which its Fabrick seems to be made, we shall take notice chiefly of three things to be done by it. To wit, In the first place, That the visible Species, or Rays of Light; sent from a lucid or from an illustrated Body, are intromitted by the Pupill, as it were thorow an hole. Secondly, The Rays so admitted being refracted, and artificially collected, through a fit Medium, are disposed according to the best Dioptrick Rules. Thirdly, That the Images of things, resulting from the due refraction and Coalition of the Beams, may be aptly represented, the interior Den of the Eye is formed, like a black Chamber with a white Wall, susceptible of the Images.

The Anatomy of the Eye, necessary for the Explication of Seeing.

If it should be further demanded, what kind of Fabrick it is of the Eye it self, and after what manner its parts are disposed, by which all its offices are performed, it will not be from the Matter, to shew here a perfect description of the Eye and its Appendix, together with the offices and uses of its parts, truly lay'd down. For truly, if any part of the whole Animal Body deserves a peculiar Anatomy, it is chiefly due to the Eye, which tho' made of a very small bulk, contains in its Structure many admirable things, and is of most noble use.

But in delivering the Anatomy of this Member, many Authors, both Physicians and Mathematicians have already labour'd so exactly, that hardly any thing can be added in this business: but because, thorough the frequent Observations from others, made of the same thing, and then again from others, an easier apprehension, and more of certainty, yea, and a more accurate Knowledge is wont to be made; therefore it may be lawful for us, to subjoyn here our description of the Eye, not taken from the Writings of others, but by our own ocular Inspection, and observation of the Eye and its parts.

Why the Eyes are two.

We need not here mention that the Eyes are two, that there may be an help provided by one, against the loss of the other; also that the impression of the Object may be made more strong, and the more certain, which notwithstanding does not become double, being prevented by the Coalition of the Optick Nerves, before they are carried to the Common Sensory: nor is it behoveful to play the Rhetorician, by telling that the Eyes are placed like Watchmen, in an high place, and well fortified, from whence they may be able to move themselves hither and thither, with notable volubility, for the receiving from every part the met with Species, and to direct its Sight every where about: But that we may go about to describe the Fabrick of the Eye, without any Circumlocution; The Parts which belong to it are either Exterior, and as an Orchard, which serve

The Parts of the Eye are either Exterior.

The Bone, Eye-lids, Hairs of the Eye-lids, Glandula or Kirnells, with the Vessels, and Excretory passages; or its parts are Intrin-

Or Interior, the Muscles, Vessels, Coates, Humors, &c.

sick, to wit, constituting the Globe it self of the Eye; which are again disposed, either about its Compass, as are the Muscles, and Vessels, with the fat lying between; or more intimate, which make up its Penetralia or inmost parts, to wit, the Coates, and Humours: In each of these, we shall note what is chiefly worth noting.

For what use the Eye-lids serve.

Among the outward parts of the Eye, first is mentioned the Eye-lids, which are like a Membranous Vail or Covering, and cover or expose the Eye as there is occasion: as often as any injury is coming, these most swiftly hiding their Tenants, defend them; also when a relaxation is required from work, and that rest indulges the Animal Spirits, presently the Eye-lids shut their Windows, like an officious Servant; but when the Spirits are called back to watching, these Vails being again opened, the Impressions of visible things are admitted.

They are two in Number.

The Eye-lids are two, to wit, the Upper and the Lower; the motion of this is either none, or very obscure; yea, it is as it were fixed to the mound Bone, with which the other Upper Eye-lid meeting, causes the shutting of the Eye to be more firm. The

Upper

Upper Eye-lid, for the double Motion of opening and shutting, is furnished with two Muscles, to wit, one strait, which arising near the Optick Nerve, with a broad and very thin Tendon, is inserted into the Margin of the Upper Eye-lid; this Muscle with its contracted Fibres, lifts up the Eye-lid: The other Muscle is Circular, which arising about the greater corner of the Eye, and from thence encompassing the lower Eye-lid, reaches to the Upper Eye-lid, nigh the other corner of the Eye, and coming under it, returns towards its beginning, this Muscle thus brought about, as it were into an Orb, draws down the Eye-lid, and so shuts up the Eye.

There are two Muscles of the Upper.

As to the Nerves which are inserted into the Muscles of the Eye-lids, we have shown elsewhere, that they are of a twofold Kind, to wit, some arising from the fifth Pair, others from the seventh; by virtue of these it comes to pass, that the motion of the Eye-lids accords with the Soul, and fitly answers to all the Passions; and that not only in opening and shutting the Eyes, for Sleeping and Waking, but in variously turning about, and composing the Eye-lids themselves, as is to be seen in Weeping, Anger, Joy, Sadness, Shame, and other Perturbations; which Kind of Pathetick motions of the Eye-lids, are for the most part involuntary, or are perform'd at least unthought of.

With what Nerves they are furnished.

By reason of the Nerves of the seventh Pair inserted also into the Eye-lids, it may be known, wherefore we suddenly shut, or open, or any other way role about our Eye-lids, at any unaccustomed Sound, coming suddenly to the Ears. It is shewed elsewhere, why the Eye-lids being affected at the approach of Sleep, with a kind of heaviness or weight, desire to be closed whether we will or no, or thò we strive against it; where we treat particularly of Sleeping and Waking.

There is nothing to be observed but what is Common, concerning the Hairs of the Eye-lids, and Eye-brows; to wit, these hairy Walls or Mounds, like Ramparts, are constituted with a double Series or row of noted Pallizadoes, for the defence of the Eyes, by which care is taken before-hand, lest any troublesom things should unawares fall into the Eyes, or lest that any thing should slide into them from the Head.

The hairs of the Eye-lids and the Eye-brows.

We will pass from the Eye-lids to the *Glandula's* or Kirnels of the Eye, which indeed stick to their Back, and put forth the Humour belonging to the Eye, thorow proper Passages, which lye open within the interior Superficies of the Eye-lids; if that a superabounding serous Humor is poured forth, more than it ought into the Eye, that falling down into a Cavity like a Bason, nigh the greater corner, enters there two little holes, from which going out into a singular passage, is carried even to the end of the Nose, where it is sent forth of Doors at an open passage; besides, the serous Humour in a Man, being plentifully heaped up, nigh to the *Ophthalmick* Kirnels, drops forth in Tears.

The Kirnels are two.

Indeed, the Eye leans on these two Kirnels, as it were soft stays laid under its round Cushion; one of these sited nigh the greater corner of the Eye, is wont to be called commonly the *Lachrymal* Kirnel, thò the other better deserves the Name; To this belong Arteries, Veins, and Nerves, also excretory Vessels, which are of two sorts, to wit, out of this Kirnel, open two or three water-carriers; into the inward Superficies of the Eye-lid; out of which the watry Humor drops forth upon the Ball of the Eye; besides, two passages also open into the Ditch of the inner Corner, which carry not thither the Water as some think, but send forth what is there deposited, and superfluous, from the excretory Vessels, and received by them, and then it is carried forth of Doors by one Channel, which going thorow the Bone of the Nose, passes thorow its passage. This Channel was first found out by *Nicholas Stenon*, who has ingeniously described its make and Use.

Their Use.

The Lachrymal Kirnel is described, with the excretory Passages.

Its use is hinted at.

This little Channel, stretched forth from the Kirnels of the Eye, thorow the passage of the Nostril, even to its end, is like a Sink, which sends forth of doors the serous filth, apt to be too much poured forth on the Eye, by a secret passage: Hence is to be noted, that not only in Weeping, excited thorow Grief, but as often as Tears are pressed forth from the Eyes, by any thing bitingly pulling them, an humidity distils from the Nose. But as to the Vessels, which are properly *Lachrymal*, it is observ'd, that three or four *Lymphaducts* or water-carriers, reaching from this Kirnel into the Eye-lid, one of them opens into the Margent of the Upper Eye-lid, another into the Margent of the Lower Eye-lid, with a little Dam raised in either, and send forth the water in Tears or Weeping between the hairs of the Eye-lids themselves. I have sometimes seen in an Ulcerous disposition of this Kirnel, a filthy Matter to have dropt forth, by Compression, from those two *Lachrymal* Puncts.

The Lachrymal Vessels.

The other Kirnel of the Eye, (commonly nameless, but deserves chiefly to be called *Lachrymal*) beginning at the lesser corner of the Eye, leaning on the back of the Eye, under the Upper Eye-lid, is carried forward, almost to the inner corner. As to its Figure,

A nameless Kirnel rather to be called the Lachrymal.

Figure, it is cleft into many Lobes, distinguished by various distances between; from every one of which, water-pipes ascend into the Eye-lids, and opening thorow the Lachrymal Puncts, within its Inward Superficies, pour forth water requisite for the watering the Eye, both for its Motion, and for Weeping: The most Learned Doctor *Sennon*, has clearly and sufficiently described this Kirnel also, with the Lachrymal Vessels, and express'd them with apt Figures; whatsoever of superfluous Serum sweats forth through the Lachrymal Vessels of this Kernel, slides into the greater corner, for that it is seated in a steep place, and from thence is sent away, through the same excretory Vessels of the other Kirnel, as it were by a common Sink.

The Vessels of
the Kirnells.

Besides these Vessels, carrying the water from the Kirnells into the Eye, and the excretory of its superfluous Humor through the Nose; there belong to the Kirnells of the Eye some others designed for other uses, to wit, Arteries, Veins, and Nerves. From the *Carotid Artery*, gotten within the Skull, and about to ascend towards the Brain, a noted branch being sent into the Compass of the Eye, imparts shoots to either Kirnel, carrying Blood to them plentifully: To this Artery (which besides the Kirnells of the Eye, respects also the chief parts of the upper Jaw) is adjoyned a Vein, which reduces the Blood from them; yea, and to both these a Nerve is added for a Companion, to wit, the *Ophthalmick Arm* of the fifth Pair, which variously binds about and knits the sanguiferous Vessels, with many shoots, sent forth in its whole Progress, and also distributes many little shoots into the Kirnells themselves.

The Matter of
Tears.

From these we may easily gather, that from the Blood carried thorow the Arteries to either Glandula or Kirnel, a watry Humor, requisit both for the perpetual watering of the Eye, and also occasionally for the matter of Tears, is sifted forth, and there heaped up, for the aforesaid uses. As to the former, these Kirnells, even as others implanted elsewhere, imbibe the Serum carried to them for constant food; to wit, because the Arteries carry the Blood thither more copiously, than the Reins are presently able to sup back; wherefore what is watery is imbibed by the substance of the Kirnel, as it were a Sponge, the bloody Humor being sent away by the Veins. For this reason, because the Nerves bind these Vessels, therefore as often as the Serum abounds too much in the Blood, destinated for the Brain, these Arteries being provoked by the Nerves, and bound together, it is separated or bolted forth, and carried more plentifully than it was wont, towards these Kirnells.

The Causes of
Weeping, and the
manner of its
being made de-
scribed.

But as to Tears, oftentimes poured forth in great plenty from these Kirnells of the Eye, that it may the better appear, by what means, and for what Causes this is done, it seems very opportune, to discourse concerning Weeping and Crying, and of the Causes and manner of its being made, which yet shall be done briefly and succinctly, because the more full Consideration of these, properly belong to the Doctrine of the Passions. In the first place therefore, concerning Weeping, we observe that it doth chiefly and almost only follow upon great Passions of the Mind, to wit, great Grief, Sadness, Pity, sudden Joy, and the like; to wit, whensoever the sensitive Soul, being struck by either a disagreeable or unaccustomed Object, is as it were compelled inwardly to shake, or to contract more near together its *Systasis*, or Constitution; so care is taken, that a greater company of Spirits, yea and a more plentiful flux of Blood, are compelled to the principal Parts, viz. The Heart and Brain, as it were the stays of Life: The Animal Spirits of their own accord leap forward to these places, as to the two fountains of Life, yea and the Blood is more fully heaped up in either; for as much as the blood-carrying Vessels, being bound together straitly by the Tract of the Nerves, drive forward swiftly to these places its Latex, and take it away, more sparingly from thence; therefore, whil't an occasion is offer'd of Weeping, presently the Bosoms of the Heart, with the whole Neighborhood, swell up and are hugely inflated, by the Blood there heaped together, and (for as much as it is suffused with abundance of Serum) very much boiling; hence, both the Lungs are stuffed up that they can yield but a sobbing respiration; and the *Diaphragma*, that it might give place to their swelling, is depressed lower, with a stronger and more often repeated *Systole*, which is the Cause of Sobbing; in the mean time, for as much as the Air is hardly blown into the Windpipe, the Lungs and the *Diaphragma* being so distended, and at last hardly returned, that mournful sound in Crying or Lamenting is effected. The parts of the Face, and Mouth, composed into a mournful Aspect, aptly answer to this Affection of the *Præcordia*; the reason of which we have shewed elsewhere; because the Nerves which Contract the *Præcordia*, are intimate Relations, and rejoyce in a mutual Sympathy, with those, which pathetically Compose the Face; in Laughing and Weeping. But whil't these things are acted in the *Præcordia* and Countenance, the business is carried no less tumultuously in the Brain; for here the Spirits being acted in Confusion, all things are upside down, and the Brain, by the too great influx of the Blood, is in danger to be either over-

Wherefore a be-
wailing, is often-
times joyned
Weeping.

turned,

turned, or drowned; which that it might not come to pass, and that madness follow not upon any Passion, the Nerves binding about the Trunks of the Arteries in many places, bind them strongly, and so repress the flowing of the Blood; and its Liquor being at first notably rarified, is thickened suddenly, and as it were melted, wherefore its Serosities running forth like a Flood, are disposed into the Kernels of the Eye, destinated for this business by Nature: Then, because these Kernels are pulled by the Pathetic Nerves, which are of the same stock, with those of the Face and *Pracordia*, and are strictly bound together, the serous Humors, by reason of these Passions of the Mind, being imbibed by the Kernels of the Eye, are as it were stroked out from thence, and so distil in showers of Tears.

From hence a reason may be had, why Tears are wont to break forth in some, after a sudden Joy, because in great Joy, joyned with admiration, the sensitive Soul enlarges it self very much, and diffuses most amply its *Systasis* or Constitution; then as it were fearing a Dissolution, it again Contracts it self; wherefore, in such an Affection, the Blood flowing forth plentifully into the Brain, blows up all the Vessels, and by reason of its fulness distends them; then after its Channel being thus intumesced, the same Vessels being presently bound hard together, suffers a Flux, and as it were growing liquid, plentifully deposes its Serosities into the aforesaid Kernels.

There remains another Consideration about Weeping, why Men or Man Kind only, or chiefly in bewailing, are wont to weep, or to shed tears? even for the same reason, which is given for Man's being a visible Creature, makes him fit for Weeping: To wit, Man is more fitly made for all Affections, and chiefly for the conceiving of Joy and Sadness, than Brute Animals; and as he is a sociable Creature, he ought to Communicate those sociable things, some signs naturally implanted in him, to wit, Laughing and Weeping: But as to the Organs, which perform these Kind of Affections, we have elsewhere observed, that there happens in Man, otherways than in Brutes, a wonderful consent between the *Pracordia*, and the parts of the Mouth and Face, by reason of the Conformation of the intercostal Nerve; so that as soon as sadness possesses the Breast, presently the Aspect of the Face, corresponds with the same Perturbation.

Thus much for the Kernels of the Eye, and their Use and Action: Among the intrinsic Parts of this Member, next follow the Muscles, concerning which, there is scarcely any thing rare to be met with, or that has not been already taken notice of by others. It is obvious for any to conceive, that so many Muscles ought to be constituted, as there are Kinds of spreading abroad, by which this Globe may be moved, as it hangs within the Compass of the Bone; for this is made after a fourfold way or manner; to wit, on that side and this side, upward and downward, and two ways obliquely, viz. By bringing it about both towards the outward, and inward corner.

For these several Kinds of Motions are constituted so many distinct Muscles, which are found almost in all perfect Animals, and are easily seen in the dissection. Four strait Muscles are inserted into the Cardinal spaces of the Eye, to wit, the Muscle lifting it up, and pressing it down, its *Zenith* and *Nadir*, and drawing to, and putting from, as it were possessing the opposite points of the Horizon, to wit, East and West; the oblique Muscles compass it about like a Sphear, towards the Exterior and the Interior corner. I pass by here, that the Muscles of the Eye, do change their Names, according to the Passions of which they are Marks; wherefore, that lifting up, is called Superb or Proud, because that in Pride, it holds the Eye elate or lifted up, which however is more true of the Eyelid, and that Muscle deserves rather the Name of Holy and Devout, because it greatly lifts up the Eye in strong Prayer; wherefore it is the manner of Hypocrites, who affect the Habit of Sanctity, so to role the Eyes about, that they hide the Pupil of the Eye, and turn up the white to be seen: The depressing Muscle, by its action shews the mark of an humble, abject, and often of a Pious Mind also; that drawing inward, may not be improperly called Drunken, because Drunkards drawing their Eyes towards the inward corner, are wont to look askint; and when one Eye is drawn in more than the other, for that by this means the Pole of the Sight is varied, they behold things as if they were double. I knew a young Man, obnoxious to the Palsie, when the drawing in Muscle was strongly drawn, the other Muscles of the left Eye being loose, by reason of the Eye being thus distorted, every object appeared double, nor could he distinguish the true one. The Muscle drawing from or outward, may be well enough called the Indignator, to wit, because in such an Affection, we bend our Eyes outwardly, with a certain aversion. The oblique Muscles may be called Amatory, because Lovers behold one another obliquely or side-ways, and as it were fearing the direct Sight of one another, they role about their Eyes like those of Cattel; hither and thither.

Wherefore Weeping comes upon sudden Joy.

Why Mankind only or chiefly Weep.

The Muscles of the Eyes and their uses described.

Four strait, two oblique.

A Consent, and Sympathy, between them all.

That the Eye might rightly perform the Act of Seeing, there is required a Consent or Harmonious acting, between all its Muscles; to wit, that all acting together, may keep and continue its Globe, like the Tube of an Optic Glass, in a just Position for Seeing; for if any Muscle overcoming its Antagonist, acts more strongly than it ought, and draws the Eye too much to its part, presently the Sight becomes distorted; and by this means it is, to wit, by reason of overmuch strength of some one Muscle, whether it so happens by a Disease, by Nature, or by an evil Custom, that some are goggle-eyed, or have them distorted or squinting; For squinting is wont to be caused by the fault of any one of the aforesaid Muscles; but especially the Muscle going about to the inward corner would indanger the bringing in of this Vice, by its exorbitances, unless prevented by Nature; for as divers visible Species, being sent from Objects at a great distance, are received together by the Organ, every one is apt to turn about their Eyes, bending them forward: wherefore Infants, when many things at once are held before their Eyes, easily are brought to squinting: But lest this Muscle, inordinately rolled about, should cause in many this Evil, it is prevented with a wonderful Artifice, that its Motion may be still kept within just limits; because, near the root of the Nose is hung a certain handle, like a Pulley, which this Muscle passing thorow, there is a necessity for it to perform its trajectory at a certain Angle, and as it were within a determinate compass.

Whence squinting comes.

Some Brutes are furnished with other two Muscles.

Besides these six Muscles which Man enjoys, and no more, and which are common to other perfect Animals, as well as him, some Brutes are furnished with two others for their peculiar uses. It is observed, that four-footed Beasts, who carry their Eyes prone or hanging down towards the Earth, have a peculiar Muscle, which holds up the Globe of the Eye, and which sustains it, lest by its weight it should be apt to slip beyond the compass of the Bone; with this Muscle are indued Kine, Horses, Sheep, Hares, Swine, and perhaps many other Animals, also a Dog is furnished with this, but has it made after another manner; but to many who have the aforesaid hanging Muscle of the Eye, is granted another Membranous Muscle, which being placed nigh the inward corner of the Eye, when it is lifted up, hides almost the whole Globe of the Eye. The use of this seems to be, that when Beasts thrust their heads to feed among high Grasse and Herbs, this Muscle hides the Pupil of the Eye, lest any thing should hurt it. The former Muscle is wont to be called the Seventh of Brutes, and this, that by which Brutes twinkle their Eyes.

The Globe of the Eye, with the Optic Nerve.

After that all the Muscles, with the Kernels and the fat lying between, are separated from the Eye, its Globe remains naked, with the Optic Nerve inserted about its bottom: This Conformation, as we have formerly observed of the Brain, is after one manner in Man, and four-footed Beasts; and after another in Birds and Fishes: for in these the whole compass of the Eye is not round, but depressed nigh to the more outward, and the posterior Superficies; and almost like to a Platter or Shield rather; but in the others, being perfectly round, it imitates the System it self of the World: The reason of the difference is easily known, by the divers framing of the Eye, which we shall show anon.

Its Figure in some is round, in others depressed.

We meet also with another notable difference in the Eyes of divers Animals, about the insertion of the Optic Nerve, for in Man, a Dog, and other more sagacious Creatures, the end of the Optic Nerve is placed directly before the Pupil, or is inserted to the Pole of the Eye it self: for the Beam, or the Optic Pole, passing thorow the Pupil or Apple of the Eye, and its middle Cavity, falls into the insertion of the Optic Nerve; but in a Sheep, a Calf, and many other four-footed Beasts, and besides in all Birds and Fishes, the insertion of the Optic Nerve being made in the Den of the most inward circular Cave, or side of the Hemispher, is at a distance from its Pole, even as the Pole of the Zodiac, from the other of the Equator. This difference Dr. Scheinerus not perceiving, when he had found the Optic Nerve to be inserted into the side, in the Eyes of great Cattel, Oxen, and Swine, too soon concluded, that it was so also in Man, and in all Creatures besides; for he says in his Third Book, *Fundam. Optic.* p. 11. *That the Optic Pole does not fall into the Optic Nerve, with any Proportion, the error of which Assertion, the Anatomy of a Man's, or a Dog's Eye, easily discovers.*

The Insertion of the Optic Nerve, is after a divers manner, in divers Animals.

It is placed either in the Pole, or at the Side of the Eye.

The reason of the divers Conformation inquired into.

If the reason of this diverse Kind of Conformation be demanded, we say, that the Primary Organ of the Sight, to wit, in which the Image or visible Species stays, and from whence it is delivered to the first Sensory, is not the Optic Nerve, but the *Retina*, netty Coat, or fifth Membrane of the Eye, on every side spread out, by the Insertion of the Optic Nerve. Further, the Image projected within the bottom of the Eye, does not consist in the small Punct, neither is it determinated to the same individual space, but being variously drawn forth, is painted now bigger, now smaller, upon the *Retina*, or fifth Coat of the Eye; yet so, as being placed nigh to the insertion of the Optic Nerve, it may presently be carried by it to the Common Sensory; when as therefore the

the Optick Nerve is placed in the Pole of the Eye, the Images disposed round about upon the *Retina*, from every part of it, do fill the whole Circle of the painted Scene. But when the infertion of this Nerve, declines from the Pole, to the side of the Eye, the apparition of the Objects stands only below; and not at all above that Punct, and so the whole apparition of visible things, is concluded within a Semi-circle. This is clear to any thinking Person, that it is fit for some Animals, that they receive many Objects at once, at one view, and that others but a few only; therefore the Optic Nerve, for the former, ought to be inserted about the middle of the Eye, and for these latter towards its side. Man, a Dog, an Horse, and perhaps some other Animals, wont to be employed with various Matters, ought to behold all things in the whole Neighbour-hood placed together: but a Sheep, Ox, Hog, and many other four-footed Beasts, and universally Fowls and Fishes, to wit, such whose chiefest task is to get their Victuals, and to defend themselves from Enemies, have no need to behold the whole Horizon, but only things placed near on the right and left hand; altho perhaps in some of these, the paucity of the Objects, is compensated with the sharpness of the Sight.

There is observed another no less noted difference in several Animals, about the Pupil of the Eye; for this is round or spherical in Man, a Dog, and in many other four-footed Beasts, in all Fowls and Fishes; but in an Ox, great Cattel, a Goat, and some others, it is oblong, like a great cleft; the reason of this difference seems to be, because that by a Man that is upright, and other Animals that are wont to lift up their heads, and to look round about on every side, many Objects, coming from both above and beneath, and from either side, out of the whole Hemisphear, are received by the Sight; wherefore the Pupil of the Eye ought to be round, that the visible Species sent in from every side, might be admitted in a round form: But Oxen, Cattel, and other Animals, almost always carrying their Heads prone, and hanging down, need only to behold such things as are presented before them, or a little of one side: wherefore, the Pupil of the Eye is depressed; and somewhat long, for the receiving the visible Species, that are only shown at hand. Further, another difference is noted, about the colour of the Ball or Pupil it self, which in Man, and in all Fowls and Fishes is perpetually black, but in four-footed Beasts, it is either grey, or blewish, like the Sky, or of a shining red, or of some other Kind, which colour notwithstanding being fixed, not in the Horney part, but in the Concave of the *Crocoideos*, shines thorow all the Humors into the Pupil. Concerning the reason of this, we may believe, that those indued with a black Pupil, see more clearly by day-light, because indeed the Image is rendered most perspicuous to the Eye, as it were in a Chamber wholly dark, but by Night they discern little or nothing at all of any Objects; on the contrary, we have observed, those furnished with a blewish, or grey, reddish, or some other shining Pupil, not to see so clearly in the day time, but much better in the night than the former; to wit, because that shining Colour of the Pupil, illuminates something the Cloyster or Optic Chamber of the Eye, that fewer Beams being there gathered together from the darkness they might constitute the visible Image.

These things concerning the Fabrick of the Eye, and its divers manner of furniture, in various Animals, being thus premised, it now remains, that we shew its Anatomy, and that we unfold its several Parts, and the uses of the Parts. We have already mentioned, what also is known to common Observation, that the Eye consists of Coats, and Humors. The Coats or Membranes are as the containing Bodies, and constitute the walls of the dark Chamber, with the little Window, and the Paper for the receiving the Images; but the Humors, are as *Dioptrick* Glasses, so placed within the hole of the dark Chamber, that they aptly break, and gather together, the Beams exhibiting the Images.

The Coats of the Eye, like the Sphears of a Globe, are either Greater, which are stretched forth thorow the whole Compass, or its greatest part; or Lesser, which contain, or include the particular Humors.

The greater Coats of the Eye are three; which seem in some measure to arise from a threefold Substance of the *Optick Nerve*; for in the Trunk of the Optic Nerve, may be found an Exterior Coat, arising from the *Dura Mater*, with which it is included as with a sheath; Another more inward, cloathing the Membrane, lyeth under this, arising from the *Pia Mater*; and within these Coats are found very many Fibrous Nerves, gathered together into one bundle. But this Nerve, being continued, to the Compass of the Eye, its Exterior Coat being much enlarged, and stretch'd out into a round inclosure, constitutes the outmost Wall of the Eye: This Coat, by reason of its hardness, (because it is strong, and is in the place of a defence against Injuries) is called the *Sclerotick*: The hinder part in most Animals is thick, and spacious, except that in a Dog, and perhaps in

The Pupil of the Eye in some round, in other longish.

The reason of this inquired into.

The Colour of the Pupil in some black, in others gray, reddish, or other-ways Coloured.

The reason of this shown.

The Parts of the Eye, are the Coats and Humors.

The Coats greater or lesser.

The greater are three.

The Sclerotick.

some others, it is thinner, and in some measure clear; but the Anterior part of this Membrane, that it may transmit the visible Species, is transparent and shining in all. But lest this should admit more forms than it ought, (by having a too broad, and too large a transparent opening) and so too confused together; another Coat, arising from the *Pericranium* grows to it, and covers it; excepting a hole left for the Pupil. This, from its Colour, is called the *Albugina* or the White, for besides that it determines the aperture of the *Cornea*, or horny or third Pannicle of the Eye, it firmly ties the Eye also to the sides of the bony Compass. The additional Coat, or the white Tunicle, besides the proper Membrane, is made up also of Tendons of Muscles, spread into a most thin Net; therefore, also it becomes white, because, when many diaphanous Membranes are thrust together, like thin cakes, they cause a shadding, and with it a whiteness, as may be perceived in the Bones and Horns of living Creatures, made up of a Pellucid Glew, also in the white of an Egg made hard by Boyling.

The *Albugine* grows to this.

The *Sclerotic* Coat, is in some round, and in others depressed.

The Figure of the *Sclerotic* Coat, is proportionate to the quality and disposition of the Humors, which are contained in the Eye; wherefore, in some (as we hinted before) it is round, in others press'd down, but in most its Anterior Part swells up, above the remaining Part of the Ocular Globe, by reason of the Watry Humor underneath, as it were a Portion of the outward Sphear, to wit, for this end, That the Compass of the whole visible *Hemisphear*, may be received together, by the Eye, as it were by a Convex Glas.

The Vessels of this Coat.

As to the Vessels which are inserted into this Coat, besides the shoots of the Nerves, sent from the fifth Pair, after they have bound about the Trunk of the *Optic* Nerve, they are bestowed on the bottom of the *Sclerotic*, whose Use or Office seems to be, variously to carry the *Optic* Nerve, with this outmost Chest or closure of the Eye, and to compose it for the receiving the Species; there are also granted to this, noted Arteries, from the Trunks of the *Carotides*, before they reach to the Brain. It is observed, that the Artery destinated for this, falling in, nigh to the Trunk of the *Optic* Nerve, imparts to the same, in its whole progress, some small Shoots, which are certainly sufficient for Heat and Nourishment; then this Artery, spread forth at the bottom of the Eye, is divided into six Branches, like so many little Rivers, all which being brought upon the *Sclerotic*, towards the *Cornea*, divide the Exterior Globe of the Eye into so many equal and distinct Regions; from these, many little shoots, going thorow the *Sclerotic*, are inserted into the *Uvea*, and after a sort knit this to the other: The Arterous branches and shoots, are every where accompanied with Veins, by which the Blood is reduced towards the wonderful Net, and at length into the Trunk of the hollow Vein.

The Coat *Chorocoeides*.

Within the *Sclerotic* Coat, or the outmost Coat of the Eye, follows the *Chorocoeides*, and is almost thorow the whole, Contiguous with it, and coheres to it, by some Fibres, and blood-carrying Vessels; this being perforated in the fore-part, leaves an opening for the Pupil of the Eye, which notwithstanding, as occasion requires, is wont to be either contracted or dilated. This Coat, being black in most Animals, is covered in the Superficies or Convex, or Concave, as it were with a black Paint, which is also fixed to the other contiguous Coat; the reason of this is, that it might render the inward Chamber of the Eye black or dark: But in some Animals, to wit, in most four-footed Beasts, a certain Interior Portion of the *Chorocoeides*, which is turned over the Pupil, shines with a diversified Colour, like the Rainbow, and according to this, the Pupil of the Eye seems to be coloured: but as this is wanting to Man, his Pupil is always black, according to the whole Picture of the *Chorocoeides*: But it appears otherways in a Dog, and otherways in a Cat, Ox, and the rest. In those also that have the Pupil round, this Signature is expanded round; those who have the Pupil stretched forth at length, like a chink, this Picture being as it were double, stands on either side of the *Optic* Nerve: The uses of this (as we said but now) is to illuminate the Pupil of the Eye, as it were with an inward Beam, that it may be able to behold things by Night, and placed in the dark; wherefore it is very shining in a Cat, but is wholly wanting to a Man, Birds, and Fishes.

Is black in most Animals but not in all.

A Portion of this, in most Brutes, is of a diversified Colour, otherwise than in Man. The reason of this is shown.

The Rainbow of the Eye is described, and its use declared.

Nigh to the opening of the Coat *Chorocoeides*, stands the Rainbow of the Eye, that is, nigh to the outmost border of this Coat, where the opening is for the Pupil, a certain Fringe, made up of Nervous Fibres, diversly coloured and disposed, covers it: These Fibres are called the *Ciliare* Processes, which like brows of hairs, being carried from the Pupil of the Eye, like rays from a luminous Body, are disposed into an Orb; These Fibres being placed in a thick row, are noted with a variegated or diversified Colour, outwardly, where they stick to the Corneous or horny Coat; in the mean time, where they are Contiguous to the brim of the Chrystalline Humour, and also to the border of the *Retina* Coat, they always appear black: These *Ciliare* Processes, do not only dilate and contract the Pupil of the Eye, but also they thrust forward, or draw backward the

Chrystalline

Chrystalline humour, and bend it hither and thither into the view of the Objects. *Fur.* The strength and irradiation of the Eye from the Rainbow.
 ther, there is in these Coloured hairs, or the Rainbow of the Eye, a certain vigor, and mighty conflux of Animal Spirits, by the Exertion of which, the Eye seems to beam forth, and to cast forth outwardly certain darts like Lightning, according to the Instinct of the Passions : yea, hence we suppose Light to be diffused, and to illuminate the Medium; for which reason, Men discern in some measure Objects in the dark. I knew a certain Man, indued with an hot Brain, who after a plentiful Drinking of Wine, was able to read distinctly, in a very dark Night; the reason of which seems to be, because the Animal Spirits, being as it were inflamed, and so beaming forth from this Rainbow, did illuminate the Medium, with an implanted Beam. Moreover, when by any stroke on the Eye, an apparition of flame, or shining appears; surely this proceeds from a sudden Concussion, and Explosion of the Spirits, lying within the Ciliar or hairy Processes. If it be demanded, by what passages the Animal Spirits run into these Fibres, we say; That from the Nerves of the sixth Pair, which bind about the Optic Trunk, certain shoots, entering the Sclerotic, and the Coracoidal Coat, come also to these Parts; besides, the Retine Coat, which is wholly Nervous, sticks to this Rainbow.

Within the Chorocoides or the Uvea, another Coat follows, whose Compass as it is less, so it is shorter in breadth; for its Border, subsisting about the lower brim of the Chrystalline Humor, is Contiguous to the lower Border of the Rainbow, and in some part sticks to it: This Coat, as it is white, so it is Medullary, and said to proceed from the Medullous and Fibrous Substance of the Optic Nerve, so that what is there of Nervous Fibres collected into a little bundle, is here like a Veil stretch'd forth of a Net-like form. Indeed, if the whole Eye may be taken for the Flower which grows in the Brain, thorow the Optic Nerve as its stalk; The Retine Coat is the Flower it self, and the two former, but the Stalk and Cup. The Retine Coat therefore being spread forth within the Chamber of the Eye, or its inmost Conclave, is like a white Wall, which receives and represents the visible Species, admitted thorow the hole of the dark Chamber; for doubtless this part, however Medullary and Fibrous, and so greatly akin to the Brain, and to the Optick Nerve it self, is the proper Organ of Seeing; to wit, on which the sensible Species is impressed, and from which the same is communicated to the chief Sensory; which shall more plainly be manifested anon, after we have unfolded the Humors of the Eye. *The Retine Coat.*
Its description and use.

Agreeable to the three Coats of the Eye, there are so many Humors of it, to wit, The Watery, Chrystalline, and Glassy: The Chrystalline Humor supplies the place of the Burning-Glass, placed within the whole of the dark Chamber, and the two other Humors, constitute and fitly determine, the spaces only, or places between, which ought to come between the first approaches of the beams into the Eye, and the place or Organ of Sight, wherefore this is put behind, the other before the Chrystalline Humor. *The Humors of the Eye Three.*

But this Chrystalline Humor it self, within the aperture or opening of the Uvea Coat, like a Glass placed before the hole, gathers together, and breaks the Beams coming thither on every side: The Substance of this is very shining, like glew, or the Gum of a Tree, and is indued with a Consistence like melted wax, yet if pressed it will not willingly flow forth. Its Figure in Man, and most four-footed Beasts, comes near to the shape of a Lentil, whose utmost Superficies is more plain, and the innermost more gibbous or bunching out; but in Fowls and Fishes, its Figure comes near to a Spherical shape; In these later, where the Chrystalline Humor is round, the whole Figure of the Eye is depressed in either; But in the other, where the Chrystalline Humor is of a depressed Figure, the Eye is found to be plainly Spherical. A reason of the Conformation of either, shall be shown afterwards: The Chrystalline Humor, tho not apt to flow forth, yet is included with a proper little Membrane, for the Lightness of it, called the Cobweb. *Chrystalline.*
Its description and uses.

In Man, and in four-footed Beasts, tho the Chrystalline Humor be of the form of a Lentil, it doth not bear out enough, so as it might receive the Beams of the whole Hemispher, therefore the watery Humor is lay'd to it, as an addition, which thrusting forth the Cornea, or horny Coat, and rendring it more bunching out, encreases outwardly the Convexity or bending forth of the Eye, which is indeed, that the visible Species might be from this place, and from that, and on every side more plentifully admitted into it, as into a Window, made forth or busting out beyond the plane of the Wall. Further, the watery Humor swelling forth with the horny Coat, breaks a little the oblique Beams falling towards the Perpendicular; and so compelling them nearer together, directs more together into the Convexity of the Chrystalline swelling. There is yet another use of this watery Humor, to wit, to temperate the Beams passing thorow *The watery Humor and its uses described.*

thorow it, being sometimes somewhat fiery, and so to render them more proportionate to the Senfory.

The glassy Humor.

Its uses.

The Plenty of the glassy Humor varies, according to the Figure of the Chrystalline Humor.

On the other side of the Chrystalline Humor, to wit, on the back of it, the glassy Humor stands, like to fused Glass; this, much more plentiful than both the other, possesses the greatest part of the Optic Chamber; also, being less Compact in it self, is apt somewhat to flow out, and is included with a most thin little Membrane: this lyes upon the *Retine Coat*, and contains the Chrystalline within its Bosom. Its Primary use is to separate the *Retine Coat* in a just space from the Chrystalline Humor, that after the Beams have pass thorow this, as it were thorow the Burning-Glass, with a due Refraction, they may have in that, placed at a just distance, their habitation: Hence, in those who have the Chrystalline Humor in the form of a Lentil, and so the Beams passing thorow, can't come together but at a greater distance, have great plenty of this glassy Humor, and its plenitude causes the Spherical Figure of the Eye; But in those, who have the Chrystalline swelling round, that the Beams passing thorow, are more crooked, and have a dwelling or nest at a less distance, the quantity of the glassy Humor is found less; and its defect causes the depressed Figure of the Eye, or of the form of a Cheese. Further, the glassy Humor, according to *Scheinerus*, being somewhat a more thin Medium, than the Chrystalline Humor, breaks a little the Beams passing thorow, from the Perpendicular, and therefore somewhat enlarges or draws forth the Picture of the visible thing, otherwise more contracted, and shews the same more conspicuous in the *Retina*. Thus much concerning Seeing, and of all the Senses; in the next Chapter, we should speak of the other Power, to wit, the Locomotive: but being we have formerly largely discoursed concerning that; we shall handle in the following, certain Affections, belonging to the Corporeal Soul, as to the Exercise of the Motions and the Senses, to wit, Sleep and Waking.

CHAP. XVI.

Of Sleeping and Waking.

Sleep Necessary for all Animals.

Such is the weak and instable Nature of all living Creatures, that they are not able, neither to Live perpetually, nor to Act and Labour continually; but that there is a Necessity for them (even as once, and at last to dye so) daily to repeat frequent turns of Sleep, as it were so many previous Monitors of Death. Though we have not experienced it, we easily know what it is to dye; to wit, when the vital Flame, like a Lamp, is either by degrees consumed, or violently extinguished, presently Heat and Light, and what flow from them, both all the Vital and Animal faculties, are abolished. But what is the formal Reason, Essence and Causes of Sleep, which we suffer, and daily experience, is almost wholly unknown. Concerning this, there are various Opinions, both of Ancients and Moderns, but they rather seem Dreams, than satisfactory Reasons: To wit, whilst some affirm Sleep to be mere Privation, others a Bond of all the Functions; these place for its Cause a retraction, or introcession of Heat, those an ascent of Vapours from the Stomach to the Head. Some assign for the subject the Brain, others the Heart, others the Stomach, and Spleen; and some again the Soul, others the Body by it self; and lastly, others both together, to wit, the whole Animal Body.

What it is unknown, or greatly Controverted.

The Opinion of Schneiderus.

He affirms Sleep to be an inorganic faculty of the Soul.

Among the latter Writers, *Conradus Schneiderus* hath of late been Eminent, who rejecting the Opinions almost of all others, and asserting Sleep not to be produced from Vapours, nor from any material Cause; nor to depend, either upon any affection of the Brain, or of any other part; affirms it to be, and Waking also, mere faculties of the Soul; to wit, innate, or born in it, and wholly inorganic. Also he saith, that the formal Reasons of either are, that the Soul, or its animadversive Faculty, sometimes withdraws, and as it were hides it self; and sometimes puts forth, and expunds it self. This Opinion, tho' in some part it seems likely, does not easily deserve our assent, because, notwithstanding he asserts Sleep and Waking to be proper Faculties of the Soul, and these inorganic and independing of the Body, he further supposes, other chief Powers of the Soul, to wit, common Sense, Memory, and Appetite, not to be performed from the divers Organs within the Brain, nor to be distinguished by their Seats, but to be diffused thorow the whole Body.

Therefore,

Therefore, that we may the more rightly Philosophize concerning Sleep, we ought to consider, what are its Subject, formal Reason, Causes, Differences, and Effects.

First, As to the first it clearly appears, that Sleep is not extended neither to the whole Soul, nor to the whole Body: for the *Pracordia*, and Organs of respiration, are exercised with a perpetual *Systole* and *Diastole*, the Viscera, dedicated for Concoction, perform their Offices more, and better in Sleep than in Waking: Further, when as the aforesaid Parts are wont to alter their actions, according to the urgencies of evident Causes, (as may be argued by the Pulse and respiration variously changed, also from Vomiting, and sometimes a sudden loosning of the Belly) the exercises of the sensitive Power, as well as the Motive, ought to be granted to them in Sleep: But the Blood is circulated, and flames forth in quiet, the nourishing and Nervous Humors are dispensed, yea, and the superfluous, and what is excrementitious, are best separated or put forth: Hence, as it appears, perpetual watches are kept about the midst, or inmost part of the Animal Body. In the mean time it is observed, that Sleep urging, all the External Senses are shut up, also that all Spontaneous Motions whatsoever cease; so that the Bodies being wholly subjected to ease, lye as they were dead. Further, the Internal Powers, related to these, such as are the Common Sense, Phantasie, Memory, Appetite, conspire together with these External Powers, and either wholly omit their Acts, or exercise them but obscurely and confusedly.

The Subject of Sleep, not the whole Body.

From these it may be plainly gathered, that the Animal Spirits, which are the next or efficient Instrument of Sense and Motion, are also the immediate Subject of Sleep; but, not all of them, but some Bands, as it were of a Superior Order, at those times keep Holy-day; but others, whose task is more assiduously required, for the Preservation of Life, are wholly inhibited.

The Animal Spirits are the immediate Subject of Sleep.

Concerning these, that the reason of the difference may appear, and that the bounds of Sleep may be defined, we must note, that there is need for all the Animal Spirits (which constituting the *Hypostasis* of the Corporeal Soul, perform all its Functions) because they cannot incessantly exercise, or ever continue their Acts, to have frequent intermission; by which, being worn out and tyred, they might be refreshed: notwithstanding there is not granted a Vacation or rest to the Spirits of every Regiment, after the same manner, nor in the like dimension.

All the Spirits enjoy rest, but not in Sleep.

For the Animal Spirits, which being born within the Brain, there constitute the chief Faculties of the Soul, and from thence flow into the Nervous stock, for the performing of the Spontaneous Acts of Sense and Motion, and effect the more hard and laborious tasks, are not tyed to the continual performance of them, but are permitted, after hard labours, to lay aside their work, and as it were to be idle; so that the Privilege of Sleep properly pertains only to these. But as to the Animal Spirits of the other Kind, which being procreated within the Cerebel, and there receive and emit the Instincts, and forces of Sense and Motion, merely Natural; and from thence flowing into the *Pracordia* and *Viscera*, perform the more assiduous Offices of the Vital and Nutritive Function; I say, that the Labours of these are more easie, and less laborious; but as they are absolutely necessary for the preserving of Life, that they ought not almost at any time to lye still, therefore the aforesaid Spirits, being busied about these Offices, are not suffered to keep Holy-day long, and to indulge themselves with Sleep, but it is sufficient for them, to intermit their tasks for a short space, and presently to resume them, and so to have, in stead of a longer Vacation, some broken times from their Labours: as chiefly appears from the pulse, and breathing, in which the times of motion and of rest, are reciprocal, and almost equal. Indeed the Spirits performing these tasks, seem as if condemned to the Stone of *Sisyphus*; to wit, that they still lift up the same burden, then resting whilst it slides down again, they presently, and so perpetually, repeat their Labour. Further, whilst that the Animal Spirits influencing the *Viscera* of Concoction, propagate the Acts of Vermiculation, from Part to Part, receive and give place to motion, and rest mutually in themselves; which also is more amply performed when we Sleep soundly; in so much, that sometimes the work of more difficult Concoction, is not to be done but in Sleep. Therefore the Empire of Sleep chiefly and almost only belongs to the Animal Spirits, inhabiting the Brain, and the Executors of the Animal Function these, (of whose Acts we are knowing) and in the Appendix both Medullary and Nervous. If those Spirits arising from the Cerebel, as influencing some Pathetick Nerves, to wit, of the fifth and sixth Pair, seem to participate of Sleep, that happens by a consent, deliver'd from the Brain; to wit, by which the Commands, as of Motion, so of rest are conveyed to them.

The Spirits only arising from the Brain, and who are the Authors of voluntary Functions enjoy Sleep.

Not those Procreated in the Cerebel.

We affirm, That the immediate Subject of Sleep, is the greater Portion of the sensitive Soul, which being rooted in the Brain, and thence diffused into many Parts of the Body, is the Author of every Spontaneous Motion: But the Mediat, the Brain it self, and

The immediate Subject of Sleep, is the Knowing Part of the sensitive Soul.

and all the sensible and moving Parts, which Communicate with it. Also, on the contrary, the other lesser part of the sensitive Soul, which being rooted in the Cerebel, and thence stretched forth into the *Præcordia, Viscera*, and some other Bodies, is the Parent of the Vital and merely Natural Function, to wit, of whose Acts the Animal is not conscious, is freed from the Bonds of Sleep.

The Mediate
are the Bodies
containing it.

The formal rea-
son of Sleep.

From these, that we may proceed to deliver the formal Reason of Sleep, let us conceive, that this greater portion of the sensitive Soul (the Animal Sleeping) doth lay aside its expansion like a Veil, sinks within it self, and hiding its head, as it were within its own Bosom, sees nor cares for nothing, that is without; so that both the Emanation of the Spirits into the globous Part of the Brain, and also their irradiation, into the Nervous stock, ceasing; the Act of spontaneous Sense and Motion, both outwardly and inwardly, is suppressed.

The beginning of
Sleep, is in the
Cortical part of
the Brain, which
is also the seat
of the Memory.

If it be demanded, in what Part or Region these Spirits dwell, who first of all possess Sleep, and begin to be indulged with rest, before any others, it may be well supposed, that the Spirits first Sleeping, are those, which flowing within the globous part of the Brain, create the Acts of the Fantasie and Memory. To wit, these, either of their own accord, or by reason of the incourse of Strangers, falling down from the Pores of the Exterior Brain, in which they were wont to expatiate, convey themselves into its more deep Marrows, or middle Parts, where as it were lying down idely, intice the Spirits there implanted to the like slothfulness; and from thence flowing into the Nervous stock, recall others from their Efflux, and solcite them to idleness. Indeed, the Spirits irradiating the outer Brain, do first of all grow stupified, and begin Sleep in their recess, as appears from hence, because there is a Necessity, for these sometimes to be repressed from their expansion, and to be driven inwards, that there may be a place left, for the instilling the Nervous juice, or matter for new bands of Spirits, into the Brain; wherefore, those veterane, or old ones, being not only wearied, go from their Station, but being as it were drowned by the Humor, plentifully rushing in, are compelled from their watches.

The Causes of
Sleep: First,
what the final
is.

From these things it will not be difficult to assign the Causes of Sleep; and first, that we may begin with the Final; (which is always the Key to the rest) If it should be demanded, for what end, the Animal Spirits going out of the globous part of the Brain, into its middle or marrowy Parts, are bound up with chains of Sleep, and so after a solemn manner, alter the vicissitudes, as of Exercise, so of Rest; this easily occurs; that the Animal Spirits (at least those who are wont to be more strongly exercised) lest they being wholly loosned should perish, and break the *Hypostasis* of the Soul, want for the sustaining of themselves a twofold prop, to wit, Rest and Food; by the former case is taken, lest the Spirits, for that they are highly volatile, should be very much drawn asunder, by too much Occupation, and acted into Confusion: wherefore, after that they have long and much laboured, they desire to rest, and be at quiet of their own accord; then by the other, to wit Food, the wastings both of themselves, and of the spirituous Liquor, with which they are washed, are repaired; therefore needful for them: But both these benefits, requisit for the Spirits, to wit, their sedation and refreshment, are granted (and almost only) to Animals in Sleep. For altho in Waking, pleasant sensible Objects do something please the Spirits, and that the nourishing Liquor, supplied from Aliments newly received in, may something cherish them, yet a fuller refreshment, and quieting, by which they are sufficiently fortified, for the lively performing the Animal Functions, are not obtained but in Sleep; for then the Spirits being at leisure for some time, from Motion, get to themselves new stores; and in the mean time the Brain, like a dry Sponge, imbibing most greedily the nutritious Liquor, takes it for Provision for it self; which after a little space, it dispenses to the several Parts, both of its proper Regiment, and also of its Appendix; yea, plenty of the Spirits, and their food, being somewhat exhausted, the Brain, as it were another Stomach, seems to be hungry after Sleep, greatly to desire it, and not to be satisfied, unless it daily enjoys it, and that in its wonted measure: for in the space of every Night, there is a certain Necessity of Sleeping for so many hours, as we have formerly accustomed our selves to; if at other times, as after Eating, an evil Custom indulges Sleep, we afterwards more hardly want it, than our Dinner; for the privation of due Sleep, or what often accustomed to, is as it were a fasting to the Brain, by which, if long affected, that, and its Nervous Appendix, languish as it were for hunger.

To wit, a refe-
ction and quiet-
ing of the Spi-
rits.

The formal Cause
of Sleep, consists
in the Rest of
the Spirits, and
in the watering
of the contain-
ing Parts.

Therefore, for the taking of Sleep, by which the Brain may be filled, with the Nutritious Humor, and the Spirits, wearied or exhausted by Motion, may be refreshed, a certain Law of Nature, or Necessity is incumbent upon us, and calls it upon us oftentimes against our Minds: But this kind of Disposition being innate to most Animals, and chiefly to Man, whose Spirits are most of all employed, is the Final or *Procatarrick*, or more remote Cause of Sleep; but its formal or Conjunct Cause, consists in these two things,

things, viz. in the Vacation or Rest of the Spirits, and in the Irrigation or watering the Parts containing them; by which (as common to either Affection) a relaxation follows, from a Tensity or Inflation of the Brain, and Nervous Parts.

As to the evident Causes or occasions, by which Sleep is wont to be introduced, first *The evident Causes.* we must distinguish concerning Sleep; That it is either Natural or Ordinary, which every one enjoys daily, for so many set hours, and its accession and duration depends upon either Conjunct Cause existing together in Act, viz. at the same time, the Spirits remitting their tasks, sink down, and the nourishing Humour flows into the Brain; then this being sufficiently watered, and they refreshed, Waking returns: Or Sleep is not Natural or Extraordinary, which for some occasions follows in an undue measure, and inconvenient time. Concerning preternatural Sleep, we shall speak more properly of it in another place; when we shall treat of Soporiferous or Sleepy Diseases. But as to the Non-natural, we have observed; that it is of a double Kind, according to the Complication of the Conjunct Cause; For either the Spirits first lye down, and so the Brain imbibes more copiously the apposite Liquor; or first the Brain is too much moistned with Humor, and so the Spirits being as it were drowned, are forced from their watches. For when the Blood every where washes the Cortex of the Brain, by almost innumerable Ramifications of Vessels, a certain spirituous Water from these bloody Rivulets, always stands at the Door, and is ready to be instilled into the Medullar Substance of the Brain; which, for as much as it is copiously received within, presently overwhelms the Spirits, and obstructs their passages, and so Sleep being call'd upon, every Animal Function ceases for a time; yet, lest this should be too frequently and untimely done, the Animal Spirits, so long as they are lively and active, inflate the Substance of the Brain, and keep it extended, so that the Spirituous Liquor, which is also Soporiferous, is not admitted, but only in a small quantity, such as may suffice for the exciting of Sleep. But if either the Spirits being weary lye down of their own accord, or are compelled by the boiling Blood coming impetuously to the borders of the Brain, to give place to it, the aforesaid Liquor, rushing in on heaps, produces almost invincible Sleep. Wherefore, according to which, either the Animal Spirits open the doors of the Brain of their own accord, or the Nervous Liquor besieging them, impetuously breaks thorow; *Sometimes from the Cortex of the Brain being too much watered.* The *Prophases*, or evident Causes of Sleep, are of this or that rank: there are many Kinds of both of these, and ways of being done, the chief of which we shall briefly touch upon.

First, In the first place therefore, there are many Causes, for which the Animal Spirits begin of their own accord to keep Holy-day, among which, the force or power of Custom obtains the chief place. For when we have accustomed our selves to Sleep at certain set hours, the Spirits about the same time, as it were dismissing the force of their Motion, leaving presently all work, and External Commerce, retire inward, and indulge themselves with Rest: The reason of which is, because the sensitive Soul, for as much as it is void of all Science, and proper direction, determinates this or that thing to be done, by outward Accidents and Circumstances; wherefore, the Animal Spirits, in what path they are once led, unless they be hinder'd, will repeat to an hair their former tracts. Hence it is, that we both Sleep, and also Awake, at set and wonted hours, also we expect and hardly can pass by, the same times of Dinner and Supper. So solemn the manner of Nature is to do the same thing which it did before, and till being taught new things, it is the manner of its Government, constantly and exactly to observe the old. An Example of this Kind of Natural assiduity is admirable, which was told me for certain, of a Fool living some years in our Neighborhood; who, tho' he were silly and foolish, yet did he know exactly, without any sign, the interspaces of the Hours, and as often as the space of an whole Hour was elapsed, as if he had been a living Clock, he would presently personate the like Number of the Hour, with so many hoarse sounds, and no business or employ about any other occupation, could make him omit this Task. He at the beginning was wont to imitate aloud, by making a noise, every stroke of the sounding Clock; and as often as he heard the founding of the Bell of the Clock, presently he cry'd, *One, Two, Three, &c.* repeating successively the several Pulsations; hence it hapned afterwards, that the Animal Spirits, by daily imitation, being accustomed to be stirred up, to such a Motion, according to the set spaces of Time, at length they were able to distinguish the same Periods of their own accord, nothing directing, as if the sliding spaces of time, had been measured out by the wheels of a Clock. *A notable Example of Natural Custom or Assiduity.*

Secondly, The Animal Spirits being wearied by the hard labour of the Body, or too serious intention of the Mind, indulge themselves with Sleep of their own accord: *2. The Spirits being weary, lye down on their own accord.* For when after immoderate exercise, by reason of Heat and Sweat flowing forth, the Spirits plentifully exhale, and those which are left being as it were poured forth and distracted one from another, as soon as those have left them, they presently lay aside all work, that they may Concentre themselves within, and recollect their forces; for the like

like reason, after vehement study, or long Contention of the Mind, by reason that the Animal Spirits become very much tyred, we grow Sleepy; yea, sometimes serious Meditation, and when imployed with Hearing (chiefly of Sacred things,) and great Attention, procures an invincible Sleep; the reason of which is, not that the Spirits are so much consumed or wearied, but because they are gathered together in two great heaps in the Brain; and so with them too great plenty of the Nervous Humor is poured in, whereby the Brain is overflowed: Hence also it is, that if presently after Eating, Reading or Philosophical Lectures be attended to, they shall cause Sleep sooner than an Opiat; to wit, because these more grave Exercises of the Mind, both convey more plentifully to the Head, the Blood; and at the same time the Spirits Concentre together on every side towards the middle Part of the Brain; wherefore, from the Blood coming to its border, a mighty heap of Nervous juice is admitted in; by which the Spirits are presently overturned, and their spaces stuffed up; the contrary happens, as often as any one after a full Banquet shall go to the Theatres, to see Plays, for the Spirits being stretched forth by delectation, blow up and distend the Brain, so that the coming in of the Sleepy Humor, tho' heaped up at the Door, is kept out.

The pleasing of the Senses, and the Phantasie, cause Sleep.

Thirdly, We may observe, that the Animal Spirits, when delighted with a soft Harmony, are invited inwards from the Organs of the Senses, and being there recreated, slide into Sleep. So a certain Musical and soft modulation of the Voice, the gentle murmur of Waters, the soft whispering of the Wind, also pleasant Fancies, as when we imagine out selves to be in a green Meadow, or splendid Houses, because by this means, the Spirits gently Concentre together, Sleep is wont to creep upon one.

The Spirits are Compelled into Sleep, by Narcotics.

Fourthly, There remains another manner of introducing Sleep, to wit, when the Animal Spirits are oppressed by *Narcotics* or *Opiats* taken inwardly, or applied outwardly, and so are inhibited the exercise of their Function. For *Opiats*, because they Poison the Spirits, extinguish their forces, as Water poured upon Fire, or Sulphur laid on the Kitchen Fire, and cause a *Torpor* or *Numness*; wherefore, if they are more largely taken, that they cannot be overcome by the Spirits put to flight, who by little and little being recollected, renew the *Systasis* of the Soul, a deadly or perpetual Sleep follows.

Their Penury or want persuades to Sleep.

Fifthly, To this rank ought to be referred the Penury or evil Constitution of the Animal Spirits; for when they are either deficient in Plenty, or are dull and Torpid, that they can neither tolerate daily or hard Exercises, nor actuate the Brain, nor defend it against the Inundations of the serous Humors, from thence are wont to be induced a *Torpor* or *Numness*, and frequent Sleepiness of the Animal Faculty; as is to be observed in Dropical and Scorbutical People: but the Consideration of this Kind of *Torpor*, we shall refer to another place, where we speak of Soporiferous Diseases.

By what, and how many ways Sleep begins from the Brain, first affected.

When its Compass is overflow'd, by the Serum coming to it.

To which may be added, the imbecillity of the Brain, and looseness of the Pores.

2. Another Kind of evident Causes, by which Sleep is introduced, consists in this, that the Brain is first affected; then by its Consent, the Animal Spirits being half overthrown, betake themselves to rest; these Kind of Effects are chiefly brought in when an heap of Serum is poured in upon the Brain from the Blood too much stuffed with a watery Humor, which watering it with too much moisture, rushes overs its Pores and Passages, and as it were throws the Animal Spirits flowing in them. Such an Inundation of Spirits is produced, either from a too great taking in of Food, whence the Blood swelling up above measure, with the nourishing Humor, too much puts down upon the Brain the plentiful provision of Nervous Juice; wherefore, presently after a more full feeding or drinking, men become Sleepy; or also, the Blood, as to its Temper, being made more watery, moistens the Brain, as it were with a perpetual shower, and so renders those affected continually Sleepy; as is wont to come to pass ordinarily in Dropical and Scorbutical People. To these may be added, and oftentimes is partly the Cause, the imbecillity or weakness of the Brain, and the looseness of its Pores, so that, they gaping too much, most easily admit the serous heap, whereby Sleepiness is brought in. For it is observed, That Drunkards, especially such as drink Wine, fall asleep with it, on the least occasion, and not only become Drunk, but also Drowsie or Sleepy. The reason of which is, that when the passages of the Brain, are more often and untimely unlocked, with the Particles of the Wine, at length become so feeble, that the Blood growing hot above measure, pours forth its Recrements upon the Brain, and so causes from thence a torpor or Stupidness therein.

Sleep not from fumes or vapors.

These are the chief means, whereby Sleep is effected, when it is excited, by reason of the overflowing of the Nervous juice, and as it were the over-turning of the Animal Spirits. But as to these, it hath been far otherways taught, by the Opinion of the Vulgar, to wit, that fumes and vapors are raised up from the Chyle, or Humors growing hot within the *Viscera* of Concoction, which cloud the Brain, and so cause a *Numness*. But this Opinion easily falls, since the Circulation of the Blood, and the more plentiful Suffusion of it on the Brain, have been known; and that the rather, because a passage from

from the Stomach into the Head, thorow so many Inwards, and bony Cloysters, like stops, seem impervious, or not passable for the sending up of fumes. Without doubt, much the greatest part of the Humor, with which the Brain is watered, and the Spirits inhabiting it, over-turned, during Sleep, is carried by the Arteries, and distilled immediately from the Mass of Blood. But altho we deny vapors elevated from the Stomach to the Head, to cause Sleep, yet by reason of some affections of the Ventricle; it manifestly appears, that Sleepiness is induced; for as much as Opiats being taken, they begin to operate oftentimes presently, and before the virtue or any of their Particles can come to the Brain, by the passage of the Blood. This also appears, because we become Sleepy from more gross Meats, and of ill Digestion, which stay long in the Stomach, and burthen it. The reason of which seems to be, because, when as the Corporeal Soul, or a principle portion of it, is the immediate Subject of Sleep, and she entertains it, for as much as being restrained from Expansion, and as it were drawing a Curtain, she enters into her self, and sinks down on every side, towards the middle of the Brain; we say, that such a subsiding of the Soul, or its chiefest part, tho done in the Brain, is oftentimes excited, by reason of the Cause lying hid in the Stomach; because there is a mighty Sympathy, between this and that; or rather, the Animal Spirits, inhabiting the Ventricle, altho arising from the Cerebel, conspire so intimately with the desiring or knowing Soul (which is the Inhabitant of the Brain) that they are able to bend, exalt, depress it every way. The Appetite of necessary or delicate food, snatches it from any other proposition or desire. The frustrated longing of big-belly'd Women, causes an Abortion, or a Monstrous Birth. At the first taste of a draught of Wine, before the Liquor can be carried into the Blood, it lifts up and wonderfully cheers the drooping Soul. In like manner on the contrary, Opiats or Sleeping Medicines, because they stupifie or mortifie the Animal Spirits, implanted in the Stomach, bring presently a Torpor to the Knowing part of the Soul, and sometimes an extinction to its whole *Hypostasis*, both flamy and lucid: For the same reason, undigested Aliments, because they fix and burthen the Spirits inhabiting the Ventricle, render the others Presiding in the Brain, for some time Dull and Torpid.

The Matter of Sleep, conveyed only by the Arteries.

Why raw and indigested meats induce Sleepiness.

That happens by reason of the Consent, which is between the Stomach and the Brain, and which it has with the whole Soul besides.

How Opiats Cause Sleep, whilst they operate in the Ventricle.

But sleep seems to begin not only from the Ventricle, but for the most part from the Eyes; for when about to Sleep of our own accord, we our selves first of all shut our Eyes, & our Eyes being made heavy, and dull, Sleep creeping upon us whether we will or no, love to be closed; yea, if we would watch longer, we rub our forehead, and Eye-lids, and open them with a certain force, as if about to cast off Sleep chiefly there arising. Concerning these, we may say, that rest, being about to be indulged to Animals, may be the less disturbed, Divine Providence hath so provided, that the Windows being presently shut, the meeting with External Objects may be hindred. The Eyes ought to perform this Office especially, as the most noble Sensory; also that they may more certainly perform it; whilst the Knowing Soul withdraws it self, and Contract its Compass, the Spirits being recalled towards the middle of the Brain; the Sight, as the Organs of the other Senses, are destitute, and left flaccid and apt to fall down; and this happens chiefly and more certainly to the Eyes, because Sleep coming on, the Brain becoming full and swell'd with the flowing in of the Nervous juyce, at that time more uberos or plentifully abounding, very much presses upon the Optic Nerves, and those moving the Eyes, lying under its basis with a long passage, (different from any others) and so hinders the wonted inflowing of the Spirits into the Sensory of Sight.

How Sleep seems to begin in the Eyes.

Thus much for the Nature, Causes, and the various ways of inducing of Sleep; there yet remains for us to consider of the chief Effects and Alterations of it, which it is wont to bring to Soul and Body, and their Parts and Humors, and first, what it brings to the Vital or Flamey part of the Soul, radicated in the Blood.

Of the Effects of Sleep.

1. Towards the Vital or Flamey part of the Soul.

Concerning this, first of all we shall note, That the Blood is more inkindled, and much more plentifully burns forth in Sleep, than in Waking: the Truth of this is plain, from the standing Observations of such as have given it for Law, that Men Sleeping, exhale of Breath forth a departure of a far greater weight, than Men Waking, tho they use Exercise and Sweat. Moreover, Reason and Experience dictate the same thing, for as a Combustible Matter, being placed near the Centre of inkindling, and heaped about it, burns more than if the same being divided into parts, smoaking and half inkindled, should be drawn out and planted here and there in various places; in like manner, it may be judged of the Blood, which being quiet in Sleep, being called aside or disturbed with no Passions, nor with the impulses of the Muscles out of the *Præcordia*, or detained out of doors, enters the Lungs with a more full Flood, and there more slowly passes thorow the Centre or place of accension; whence, there is a Necessity, that it should then be more plentifully inkindled, and burn with a greater flame, than if touch'd only with a more light burning, it should hastily pass thorow those places. But every one doth know

The Blood is more inkindled, and inflamed in Sleep, than in Waking.

Wherefore those that Sleep, are apt to be Cold outwardly.

by Experience in himself, that in Sleeping, the Præcordia grow very hot, and the External Parts are apt to be cold; wherefore, there is need of covering them with Bed-Cloaths, whereby the Effluvia, detained about the Compass of the Body, might warm it, whilst in the mean time there is a Burning in the Breast, and from the Flame and Soot ascending from thence, the Tongue and Parts about the Mouth, as if roasted, are white: Hence in the Day-time those Sleeping in the open Air, or any where else, unless well defended with Cloaths, take Cold: for by reason of the Heat being drawn back, the Cold little Bodies of the Air compassing them, enter into the Pores, and stop them up; but on the other side, *Asthmatical* People, and such as have their Lungs stuffed or bound together, or are otherways difficult to be moved, hardly Sleep within the Bed, because the ambient Heat so greatly increases the Flame, inkindled in the Præcordia, that for the eventuating it, and conveying it thorow the Arteries, the Lungs being weak, and growing tyred in the Motion, are scarce, nay, not at all sufficient.

2. Sleep allays the disorders of the Blood.

2. For as much as the Blood is more inkindled during Sleep, therefore then chiefly its disorders are allayed. But these are of a twofold Kind: to wit, either the Blood is variously agitated hither and thither by the impulses of the Containing and Neighbouring Bodies, as in violent Passions, and Commotions both of the Body and of the Soul: Or it grows turgid, or swells up by its proper rage, after the manner of fermenting Wine, from the Heterogene, and heating Particles being mixed with it. As to the First, so long as we are Waking, the Course of the Blood being very much disturbed, is continually agitated as it were with certain winds: because the Fantastic, more strong Meditation, the Appetite, and the several Passions, drive the Blood sometimes more swiftly, sometimes repress it by their Influence, snatch it impetuously sometimes into these, sometimes into those Parts, and thence again repel it. Besides these Floods, stirred up by the Mind, also the Motions of the Body and Members, render its Course yet more troubled and dangerous; because the Sanguiferous Vessels, being variously pressed, by the Motive Parts, and by and by released; they variously transfer, and call back the Blood, and by and by snatch it elsewhere; hence, its Humour, so long as it rapidly runs from place to place, evaporates less, and so heaps together a greater stock of Excrementitious Matter, which being suppressed within, stirs up Preternatural Heat, and renders the Flame of the Blood unequal, more smoaky, and troubled, yea sharp and biting, and so troublefom to the Heart and Brain, and also to several Viscera, and sometimes to the whole Nervous Kind, all which notwithstanding Sleep allays; yea whilst the Animal Spirits lye quiet, like allayed winds, the Sea of the Blood presently becomes Calm.

Whither they are induced by the containing Bodies.

The Internal boiling up of the Blood, is also allayed by Sleep.

Nor is the Blood, disturbed by reason of its proper Effervescency, less quieted by Sleep: for when it grows hot from such a Cause, it flames not forth with a clear and bright Flame, but fumes up with Smoak and Soot, and therefore being less eventuated, diffuseth a very troublefom and sharp heat: which also is more infestous, because the Recrements of the Blood, to wit, the Serum, and adust, and otherways viscous Particles, being involved with its smoaking Latex, cannot be separated and carried away. But in Sleep, the Blood is soon quieted, and passes more slowly thorow the place of inkindling, to wit, the Lungs; wherefore being there first more inkindled, it burns with a clearer Flame, and also more mildly, and so the smoak presently ceasing, and some Heterogenous Particles being burnt, all the rest extricating themselves from Confusion, what are profitable are employed in their designed Offices, and what are unprofitable, are bolted or sifted forth, partly by Breathing, Transpiration, or Sweat, and partly thorow the other Emunctories.

The Blood performs its Offices, (which are the generation of the Animal Spirits, and the nourishing of the Parts) better in Sleep.

3. The Blood burning forth more clearly and plentifully in Sleep, at that time also performs better, yea chiefly, or almost only its Offices, the chief of which are, the Stillling forth of the Animal Spirits, and the Nutrition of the solid Parts. And first, it Prepares best of all Matter for both these, to wit, it well subdues, dresses, and ripens the Chyme, infused into its Mass: then it instills the more pure and more subtil Part into the Shell of the Brain, from which, the veterane Spirits, during Sleep depart, for the end that a way may be open, for the Nervous or Spirituous Liquor to restore their Stores; and in the mean time, the other part of the Chyme, is conveyed every way by the Arteries, to the solid Parts, and whilst they are quiet, it is best of all put upon them, and suffered to grow to them; otherwise, by their too great Motion and Agitation (as in Waking) it is apt to be shaken and wiped off.

Sleep is not to be yielded to, presently after Eating.

But that Nutrition, and the Production of Animal Spirits may be rightly performed, in Sleep, it is not to be presently indulged after Eating; for so the aforesaid Offices are wont, not only to be hindred, but perverted into Evil: because if any one Sleep with his Belly full, the Chyle as yet Crude, is snatched into the Blood: then before it can be there broken small, and mixed with the Blood exactly, it is exposed to a more full inkindling within the Lungs; that from thence the Lungs themselves not rarely draw,

as from Juices and Vapours there sent forth, from the Crude inkindled Matter (as it were from green Wood) an Evil : which thing indeed is observed of many, falling into the *Phthisis* or Consumption of the Lungs. Thirdly, At length from the *Chyme* so evilly prepared, neither pure Spirits are dispensed to the Brain, nor laudible nourishment to the solid Parts; yea, that is obscured and made dull by Fumes and Vapours, and these are disposed into a *Cachexie* or *Atrophie*.

Such Sleep hurts the Lungs and Brain. Makes the Spirits more dull and gives evil nourishment.

So much concerning the Effects and Alterations of Sleep, which indeed are wont to be more immediately impressed on the Flamey part of the Soul, rooted in the Blood, but mediately on the Parts of the Body depending upon it : Now let us see next, what this Passion brings to the other Part of the Soul, viz. the Lucid; and its Subjects, to wit, the Brain and Nervous Stock; Concerning these, we will shew what Sleep contributes to the dispensation of the Nervous Liquor, and to the generation of Spirits out of it, we shall also further Consider, what sort of influence it has on their Exercises and Government.

What Sleep affords to the lucid part of the Soul.

As to these, First, It is to be noted, which we before-mentioned, to wit, that the Spirits of the Regiment of the Brain, the Executors of every Spontaneous Function, are employed only Waking; and that others arising from the Cerebel, both Waking and in Sleep: There is need for Sleep only for the former, whilst they are well, that their Expences or consumed Stores might be by it repaired: yea, and that the languishing or weariness of those remaining might be refreshed. This every one experiences in himself, and feels that there is no farther need of explaining it: But if the same Spirits, by some Morbifick Cause, being provoked, are moved into disorder, that they become irregular about the Acts of Motions, or of the Senses, whether Interior or Exterior, and stir up a Delirium, Convulsions, or Pains, Sleep, like a Charm, fully quiets these Spirits, how mad and devilish soever they be: wherefore if it comes not of it self, in these Cases it ought to be fetch'd with Opiats.

It refreshes the wearied Spirits inhabiting the Brain.

And allays them, being out of order.

But as to the Spirits, the inhabitants of the Cerebel, because, in Waking they are disturbed by the business and tumult of the Spontaneous Functions, and being called away from their Labours are hindered; therefore, they perform their tasks better in the rest and deep silence of the others: Hence the Concoction and the distribution of the Food, and the Separation of the Excrements, yea, and the *Oeconomy* of the whole Animal Function, is best performed by reason of Sleep: Hence, if at any time, too much Meat, or more gross than is wont, being eaten, molests the Stomach, and inducing fulness, nau- seousness, or bitter and acid belching to it, approaching Sleep, for the most Parts takes away these Evils, and facilitating the Concoction of the *Chyle*, clears it from its sharp- ness, foulness, and bitterness. The reason of which is, because the Animal Spirits, which actuating the Fibres of the Stomach, serve for Digestion, whilst awake; being forced to bear its manner or guise towards the Brain, and its Parts, are distracted here and there, and are called away from their proper work, so that the Meat being as it were unfermented, and undigested, stays in the Ventricle. This every one plainly experien- ces in himself, if presently he sits down after feeding to Study, or serious Reading, for then the Brain being full and disturbed, the ponderous and heavy *Chyle* in the Stomach, is deprived of Digestion: But in Sleep, the Spirits inhabiting the Ventricle, being freed from the Businesses of the Brain, do best of all perform their task, and rightly digest and exalt by Fermentation, the *Chyle* in the Stomach, like an Elixir in a Furnace, with an equal and convenient heat. I might here enumerate other benefits of Sleep, for as much as it refreshes the whole Faculties of the Soul, renews the vigour of the Intellect or Wit, sharpens the Senses, stops the tumults of Passions, recollects the forces of the Co- gitations, as often as they are either wholly enervated, or distracted by immoderate Stu- dy, or long Waking, allays and quiets all things, and heals the weak Brain, and the languishments of its Parts, yea, and of all other Parts and Powers, by giving to them new forces or strength, as it were Food to such as want.

The Spirits in- habiting the Ce- rebel, are dis- turbed, in Wa- king, with the Spirits of the other Regiment.

Why those being disturbed, do perform their Offices better, whilst these lye quiet in Sleep.

Other benefits of Sleep are noted.

Hence Chylifi- cation, and other functions mere- ly Natural, are performed best of all in Sleep.

The Nature, Causes, and Effects of Sleep, being unfolded after this manner, before we wholly leave its Consideration, it will not be from the Matter, to subjoyn something of Dreams, we shall here purposely pass over what manner of Signification they have, both Natural, as they indicate the intemperance of the Brain, and also fatidical, as if they were inspired by a *Dæmon*, and are affirmed to Prophesie things to come: we shall only inquire by what Motion, and agitation of the Animal Spirits, Dreams are produced in the Brain. We say therefore, that the Animal Spirits, although they affect naturally alternate times of Motion and Rest, and whilst they indulge Rest, instilling fresh Ner- vous Humor to the Brain, they suffer themselves to be bound together with Embraces, as it were with Chains, that they may not enter into Motion; yet it for the most part happens, that some Spirits easily cast off this Bond, and love to wander hither and thither, in the deep silence of the Rest. And indeed Dreams are only the Excursions of

Of Dreams.

What they are.

some

some Spirits in the Brain, from their bond or tye, which, whilst the rest are strictly bound together, wander about, without any Guide or Ruler; and repeat the types or shadows of Motions, as it were Dances before learnt; and are wont to represent the Cogitations of things, though after a very confused manner. The Spirits which being got loose, variously run about, whilst the rest are bound together, gain the Liberty of Motion, by a twofold means. To wit, some Spirits, fly from the Captivity of Sleep, for the most part, by reason of the Heat and Agitation of the Brain, as by Drinking of Wine, the fume of Tobacco, immoderate Exercise, as also by the Passions, and more hard study, is wont to arise: for by these means, the Spirits are stirred up, by a certain Stimulation or Provokement, and are driven as it were into rage, that, though Sleep creep upon them, all of them will not be bound or restrained, but that some of them will walk about the Sepulchers of the rest, like Spectres in a Church-yard, and Cause stupendious Apparitions of things. Another Exfufcitation of some Spirits in the Brain, whereby Dreams are produced, is made by reason of some Spirits being disturbed in other Parts, as in the Præcordia, Stomach, Spleen, Genitals, &c. By which, whilst the same Perturbation is Communicated by the Nerves to the Brain, perhaps one or two Handfuls or Bands of Spirits, there stirred up, causes various Phantasies to be represented. In the Disease called the *Incubus* or Night-Mare, when the Præcordia are stop'd in their Motion, or otherwise hindred, by reason of the Nerves being bound together, we Dream some Animal or heavy weight lying upon the Breast, stops our Breathing. The Genital Humor growing turgid or swelling up in the Vessels, and irritating them, produces immodest Dreams. Undigested and gross Meats, eaten at Supper, because they aggravate or lye heavy in the Ventricle, and trouble it, render Sleep also troubled, and infested with terrible and affrightful Phantasies; in like manner we might easily shew, that it is the same with many other Parts.

They are sometimes excited by the Spirits inhabiting the Brain.

Sometimes by Spirits inhabiting other Parts, to wit, the Stomach, Spleen, Genitals.

Dreams sometimes stir up local Motions.

Whilst as it were private Troops of Spirits, being excited in the Brain, carrying themselves hither and thither, exercise the Phantasie, their Divergency or Excursions happen sometimes regularly, sometimes inordinately: and therefore Dreams, represent either the Series of things before acted, or only *Chimeras*, or Notions altogether incongruous and disagreeing. Further, whilst the Animal Spirits, being agitated by this means, within the Brain, produce Dreams or the Images of Cogitations, do often leap back, into the Nervous Stock, and there stirring up other Spirits, produce divers sorts of local Motions: wherefore some Men also, when they Sleep soundly, are wont to rise out of their Bed, to walk here and there, to remove the Household-stuff from place to place, oftentimes to put on their Cloaths, to open the Doors, go up Stairs, and to pass over Rocky places, which they could scarce go over when Awake; in the meantime if they meet with any Obstacle in their Progress, they either advisedly pass by it, or remove it out of the way. I knew a certain Man, who was wont after this manner to walk a-Nights like a Spectre, and to speak to others whom he met being Awake, would take them by the hand, and often-times strike them, then, unless he being roughly handled did Awake; returning to his Bed, and after Awakening of his own accord, knew nothing at all of what he had done. Yea, it is observed of most of these Night-walkers like Spirits, that being awakned, they scarce remember any thing of what they did, or acted in their Sleep; as if they suffer'd something that was different from other Dreamers; for these think that they perform local Motions, when indeed there is no such thing, but the others move from place to place, and yet know nothing of it. In Dreamers, the Spirits being stirred up, spread or are carried wholly inwards, towards the Callous Body, and affect only the Imagination and Memory: but in those walking in their Sleep, some handfuls or bands of them, being awakned, direct their tendency only outwards, towards the moving Parts, in the mean time, the Common Sense, Imagination, and Memory are not at all affected. It is wonderful, what ordinarily happens to Witches, or Wise-women; to wit, they, whilst they lye Buried in a profound Sleep imagine that they are in very far and remote places, and that they have seen the Spectacles of Seas and Lands, and things wholly unknown to them, and shall exactly describe them; which without doubt is, because the Devil brings the Idea's of these things before the Phantasie, and so strongly impresses them, that they for a certain believe, that they had been in them: On the contrary, Walkers in their Sleep, wander about the whole House, and its Precincts, and truly perform divers Actions, of which, when they are Awake, they are wholly ignorant. If the reason of this Kind of Passion be inquired into, this first of all occurs; that those so affected, freely exercise, at that time, the Faculties, both Sensitive and Locomotive; because, they not only move their Feet and Arms, as it were in certain Measures and Numbers, as a Machine furnished with wheels and force is wont to do; but moreover, they hear with their Ears, see with their Eyes, and with a certain discretion vary their local Motions, according to the Impressions made

made from sensible things. Wherefore, from hence we may lawfully conclude, that some Animal Spirits, being stirred up inordinately, within the hinder Part of the middle of the Brain, perhaps about the streaked Bodies, do strike upon the little heads of the Nerves, and so raise up other Spirits, implanted by a long Series, within the nervous Passages, and the moving Parts, and drive them into Motions before accustomed to; hence the divers movings of the Body and Members, are produced. But, because the tendency of the Spirits excited is made only outwards, and is not at all reflected inwards into the streaked and Callous Bodies; therefore, for that the Common Sensory nor the Imagination are affected, they neither perceive nor remember the Actions they had done. If it should be demanded, (for as much as the Common Sense at this time is stupified or asleep) by what instinct the Animal Spirits are determined, according to the Impressions of Sensible Things, for the performing of local Motions of this or that Kind; It may be said, That this reciprocation of Sense and Motion, depends chiefly upon Custom, viz. The Spirits being before accustomed to be ordered after this or that manner, and having gotten the Liberty of Action in Sleep, compose themselves of their own accord, for the performing of their wonted Measures; even as when an Harper, whilst he is thinking of some other thing, his Fingers being before taught the Numbers of the Tune, exactly strike the Strings, with wonderful agility and discretion.

Therefore, the Cause of walking in Sleep, seems to consist in this, viz. That the Animal Spirits are too fierce and unquiet, and will not all lye down together, but that some of them, more fierce than the rest, leap forth of their own accord, and enter into Motion, like as perhaps one or two Dogs, starting out without government, leave the company of the rest and fall to Hunting: For that Cause also, the Spirits so apt to wander and roam about for Excursion, obtain their more free spaces in the Oblong Marrow, nigh the Nervous Original, rather than in the Brain or in its middle or marrowie Part. For it seems, that during Sleep, the Pores and Passages in the globous frame of the Brain, are stuffed up so, that the Spirits there, like to water frozen, are thrust in hard together; in the mean time, the Substance within the Medullar Processes of the Brain, and the Oblong Marrow, which lead towards the Nervous Original, is more loose, and possessed less with an adventitious Humour; that the Spirits there being ready for Motion, easily make way for themselves to go forth, and entring the little heads of the Nerves, produce local Motions, of which the Common Sense, and the Superior Faculties of the Soul are utterly ignorant. For such a Disposition of the Brain and its Appendix, which inclines to wandering by Night, as if it depended upon a certain peculiar Conformation of the Organ, is proper to some Men from their Birth; nor does it indifferently happen to all Men, or is ever contracted by the reason of inordinate Living. I have known in a certain Family, where both the Father, and all his Children were obnoxious to this Affection, the Brothers would often run up and down in the Night, in their Sleep, sometimes meet and lay hold upon one another, and so awake one another. But others, who had not this Evil impress'd upon them from their Birth, have fallen into this Distemper, without any fore-warning or manifest Occasion.

Thus much concerning Sleep, and by the by of Dreams: we have largely handled thus the Nature of it, because this Speculation very much Conduces to the illustrating the Affections of the Brain, and the Nervous Stock. It behoves us next, that we consider of the Aurora of Sleep, to wit, Waking; but this may be considered under a twofold respect; either First, for as much as it succeeds Sleep, it is its bound; or Secondly, according to its proper Essence. As to the former, we Awake, or Sleep is shaken off, either because it ends of its own accord, or because it is interrupted. That it may end of its own accord, two things are requisite, to wit, that the Animal Spirits, being enough refreshed, rise up of their own accord, and return to their wonted watches; which indeed, they for the most part do, at a set-time, unless hinder'd: Secondly, That what ever is superfluous of the serous Humor, by whose Embraces the Spirits are bound, be evaporated: for after Banquetting, or often Drinking, by which a greater plenty of the serous and spirituous Latex is carried to the Brain, we Sleep longer; so that there is need that Sleep be longer protracted, that it may suffice to spew forth the untamed Wine. But Rest is very much interrupted by a violent Sensation; to wit, some Spirits dwelling about the Extremities of the Nerves, being awakned by the impulse of some strong object, awake others in the Common Sensory, whereby Sensation is performed, and then the stroke being further continued, all, being, as it were at a Sign given, called to Arms, awake suddenly, and fall to their watches. This kind of troublefom Sensation, which awakes the Animal Spirits from Sleep, is not only brought in from an outward sensible thing, as when a great sound, or stroke made on the Flesh, shakes off Sleep; but sometimes the Nervous Parts are pulled by a sharp Humor, Physick, Worms, and other Internal Distempers, and so a Convulsion or Pain arising, the Spirits are compelled into Motion, and for that reason,

Of Waking.
A double Consideration of it.
1. As it follows upon Sleep.
Waking is either Natural or Violent.

son, we are excited from Sleep. As often as Sleep is broken off sooner than it ought, often yawning, and reatching, for the most part follows: the reason of which is, because the Spirits being awakned, strive by contracting and extending those Parts, to shake off the Dewie Humor, not sufficiently evaporated from the Brain and Nervous Parts. Further, If we are forced to awake, before the Spirits are refreshed with their wonted Provision, they from thence become dull and heavy, and less ready for the exercise of the Animal Function.

*The Essence or
formal Reason
of Waking.*

As to the Essence or formal Reason of Waking, it consists in the liberty and expansion of the Animal Spirits, in the Brain, and the whole Nervous Stock. For these, like standing Souldiers, desire to watch, both to meet the sensible Object, also by reason of their obedience towards the Superior Powers of the Soul, so long as they are fit for this work: But that the Animal Spirits may be able to perform their watches in a just time, and with their whole strength it is required, that they should be free without any Impediments; to wit, that they be not irritated with any gross, or otherways Excrementitious Humor, nor drowned with a serous heap, but that being free from all burthen, they might remain ready, and still nimble for the swiftest Motions. Then Secondly, That the Spirits may rightly perform their watches, there is heed, that they should be only intangled in moderate Affairs. Being fitted by these Kind of defences, they lively accomplish their Task, and daily for so many hours, continue their Motion, like the Wheels of a Clock, and then, the time being expired, they go to Rest of their own accord.

The End of the First Part.

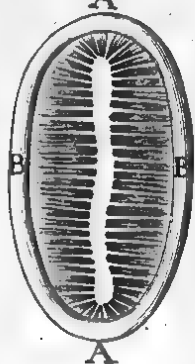


Figura. II^{da}

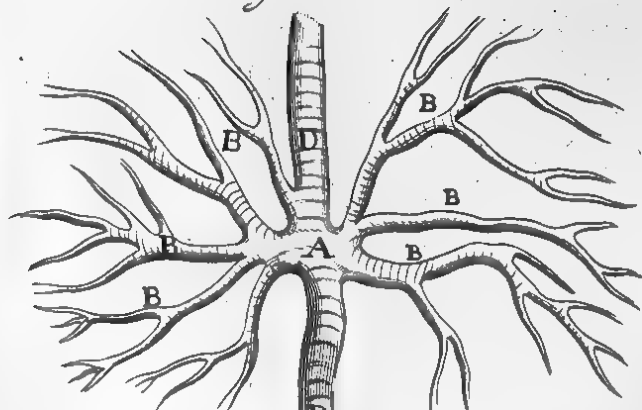


Figura. III^{ta}

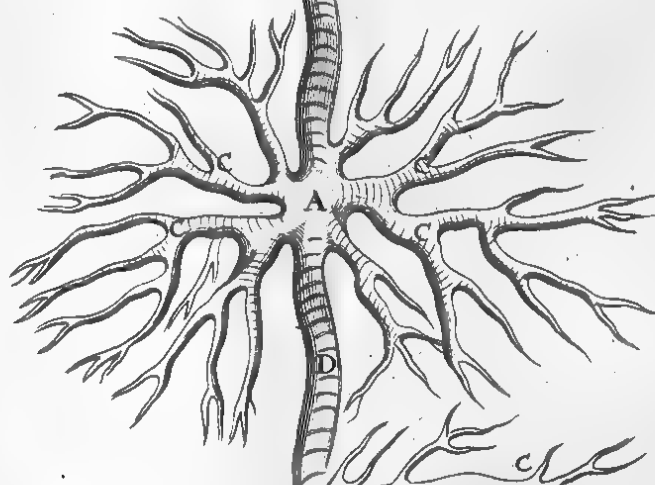


Figura. III^{ta}



Tabula II. ^{da}

page 19

Figura. I.^a

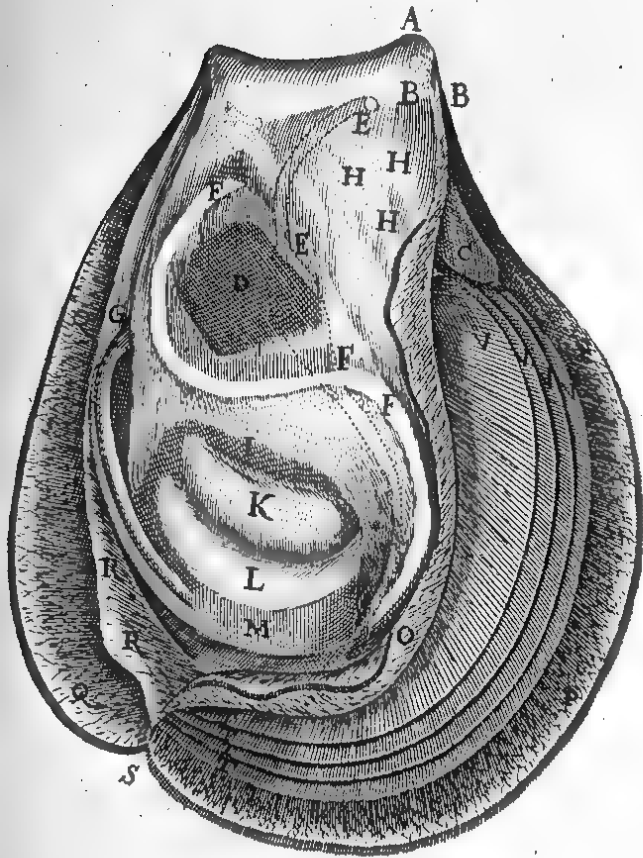


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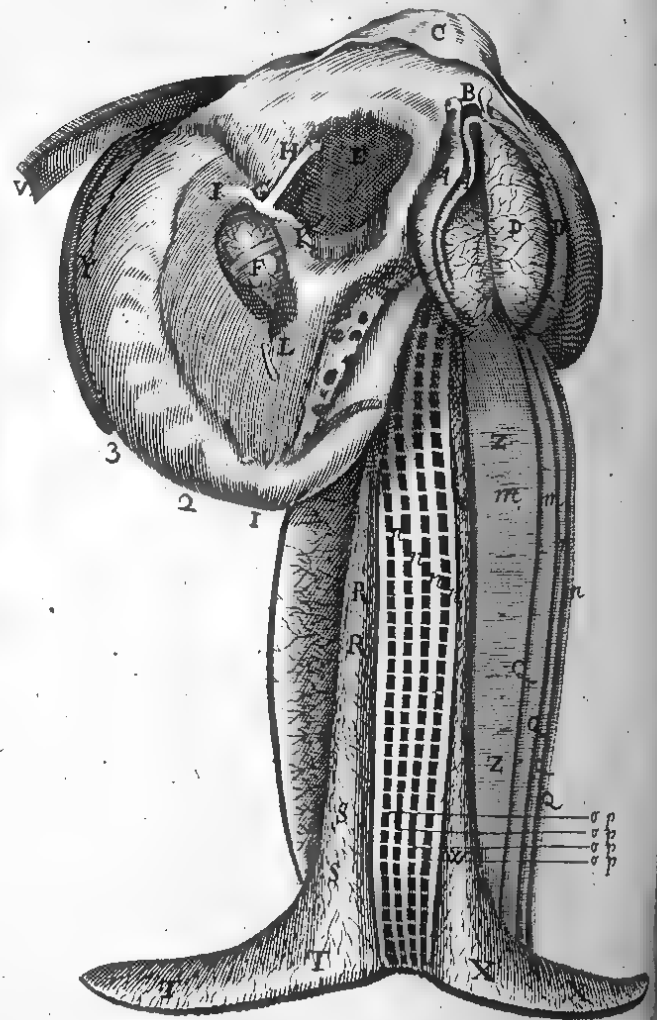


Figura I^{ma}

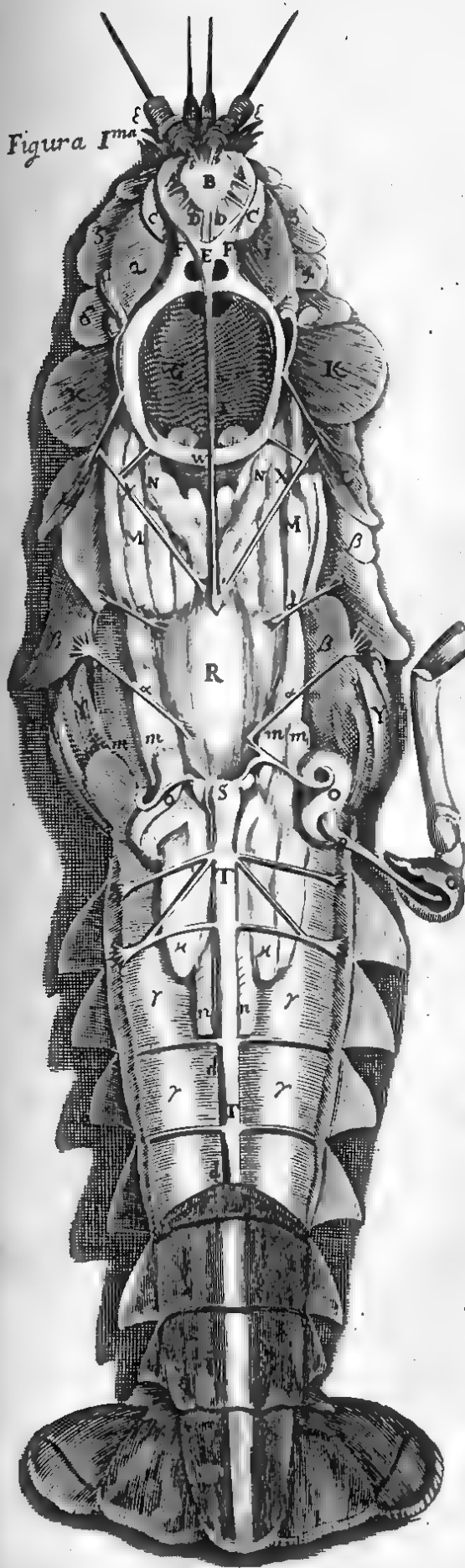


Figura II^a

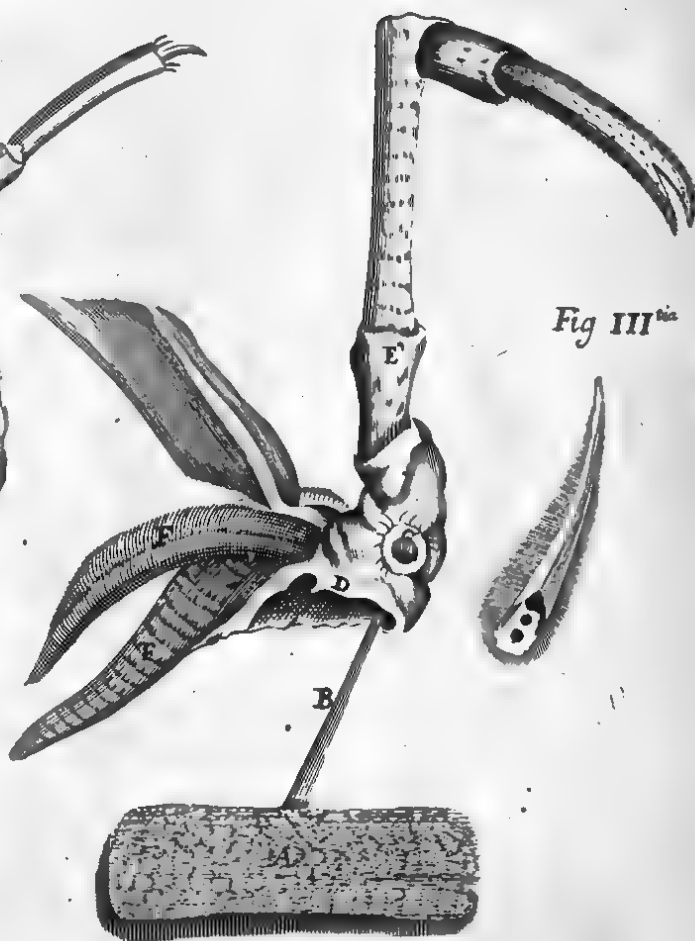


Fig III^{ta}

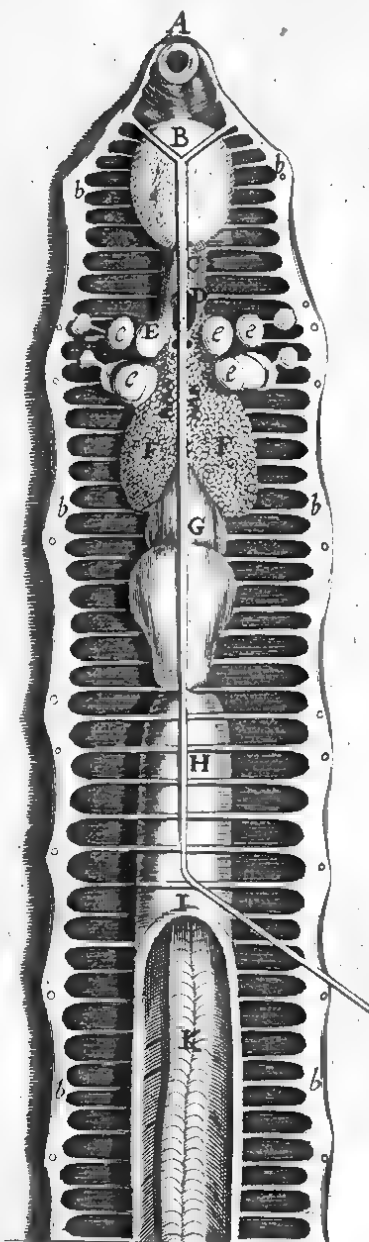
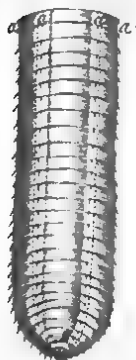


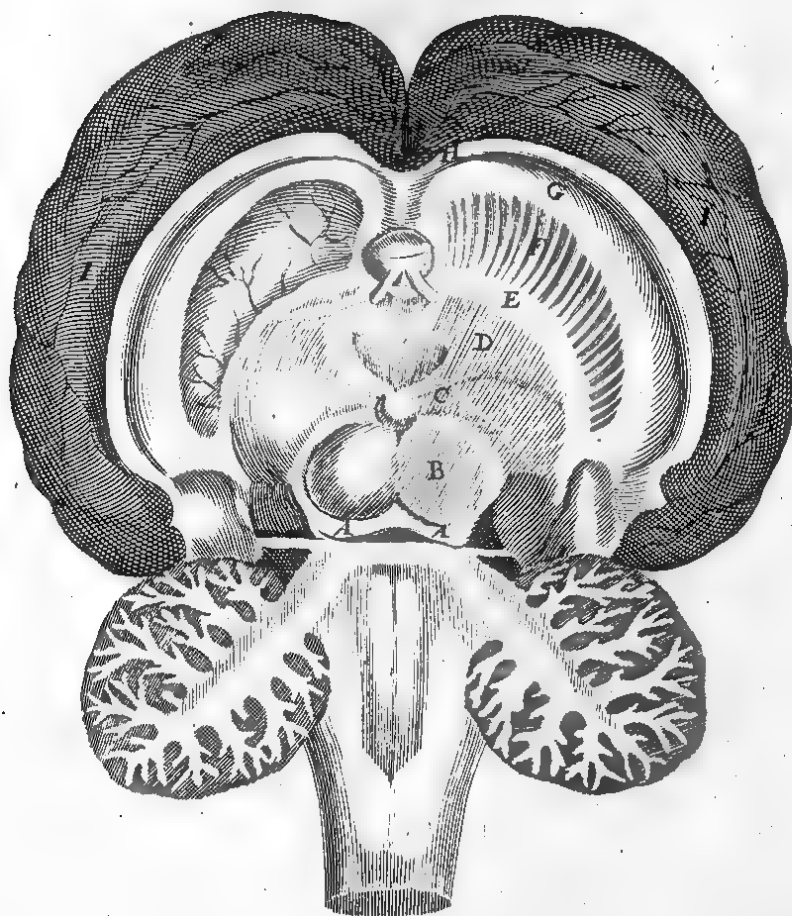
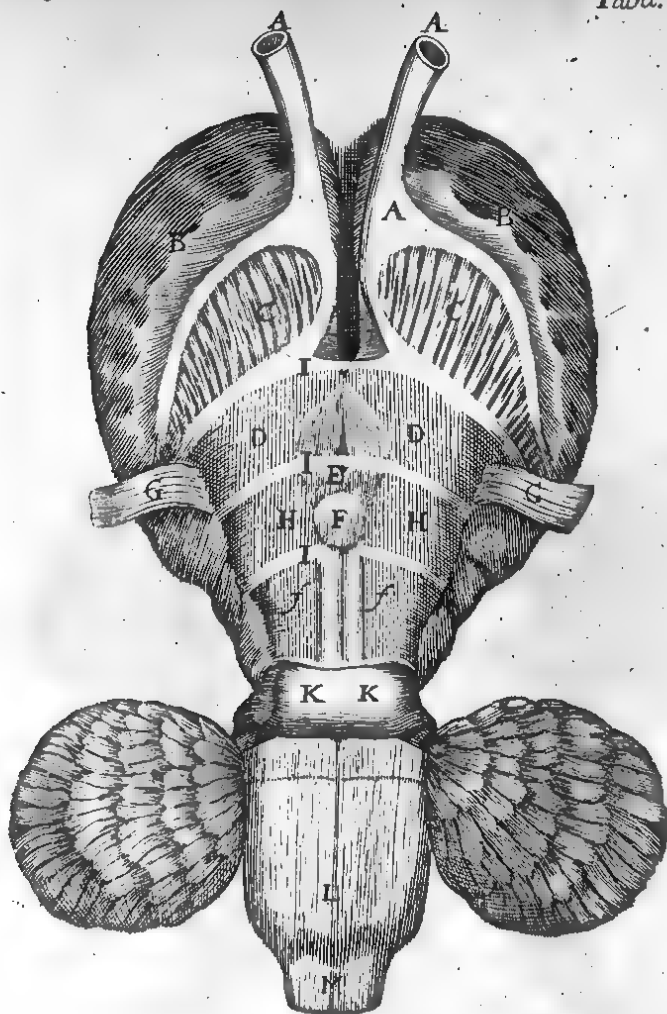
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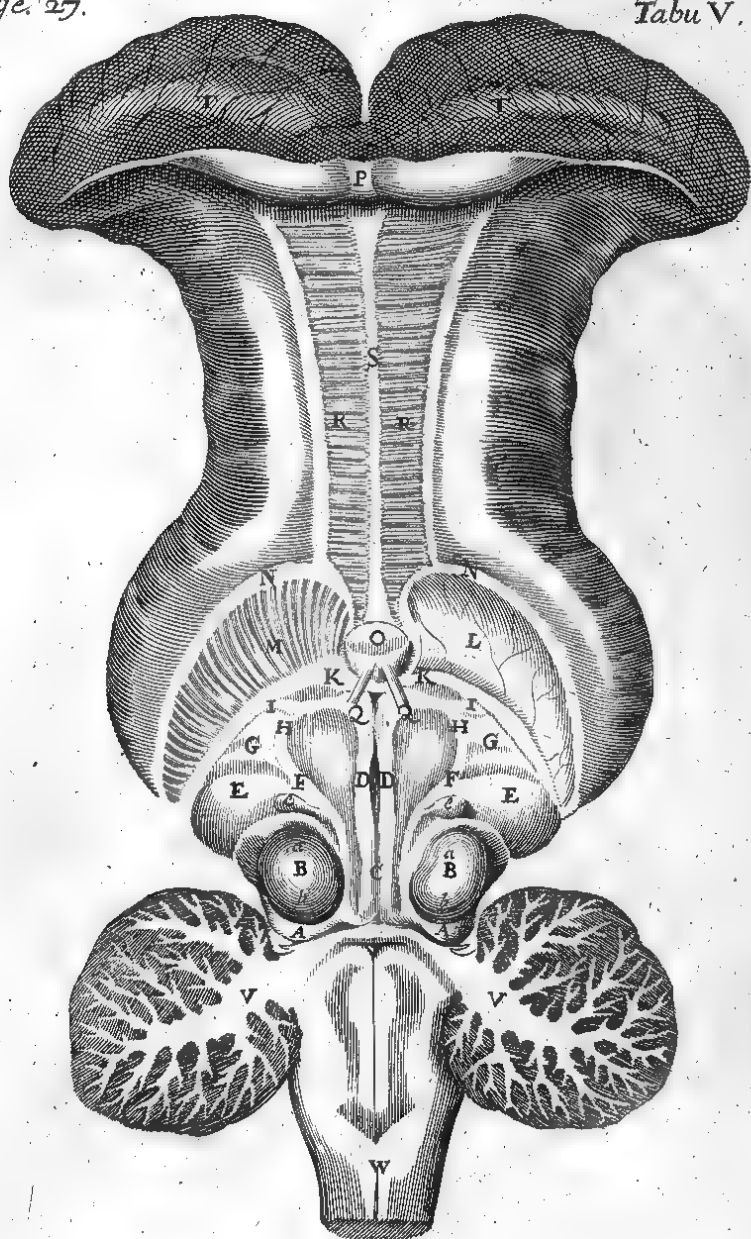
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Figura III^{ta} pag^{8a}

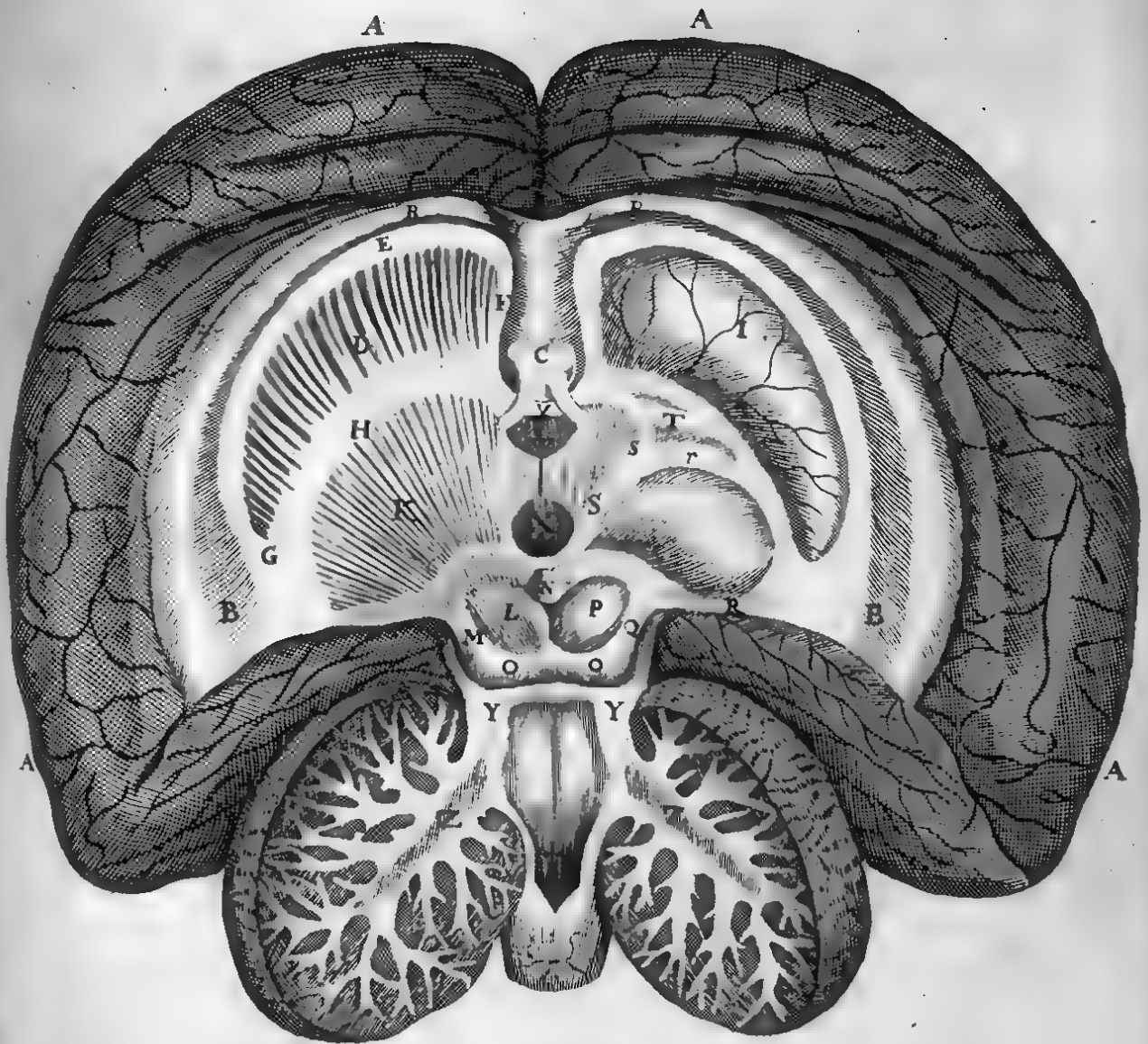
Figura II^{da}











THE SECOND PART PATHOLOGICAL: OR

Of the DISEASES which belong to the Corporeal
Soul and its Subjects, *viz.*

The Brain and the Nervous Stock.

CHAP. I.

Of the Headach.

THE pain of the Head is wont to be accounted the chiefest of the Diseases of the Head, and as it were to lead the troops of the other Affections of that part; for that it is the most common and most frequent symptom, to which indeed there is none but is sometimes obnoxious, so that it is become a Proverb, as a sign of a more rare and admirable thing, *That his Head did never ache.*

The Pain of the Head the chiefest and most common affliction among Diseases.

The Headach, though it be a most frequent Distemper, hath so various, uncertain, and often a contrary original, that it seems most difficult to deliver an exact *Theorie* of its appearance, containing the solutions of so manifold, and often opposite things. This Disease being constant to no temperament, constitution, or manner of living, nor to no kind of evident or adjoining causes; ordinarily falls upon cold and hot, sober and intemperate, the empty and the full bellied, the fat and the lean, the young and old, yea upon Men and Women of every age, state, or condition. Hence, because they cannot satisfy any one sick with this Distemper, with the causes of it, most commonly they say, they all proceed from Vapours. Further, the Cure of this Disease is more happily instituted, not so much by certain Indications, as by trying various things, and at length, by collecting an Extemporary method of Healing, from things helping and hurting. Wherefore, if I should go about to untie this hard knot, by drawing forth the matter more deeply and more accurately, I must ask for pardon, if I am carried, by a long compass, thorow the various Series and Complication of Causes: and if at length, by any means, the *Ariology* or the Reason of this Disease, may be fully detected, a more certain way to its Cure may be opened.

The Causes of it manifold, and very diverse, that they can hardly be methodically recited: Hence it is, that its Cure is often instituted Empirically.

Therefore, that we may go on more fully to institute this *Pathology*, or shewing the Causes or symptoms of this Disease, we ought first of all to unfold the Subject, and the formal reason of this Disease, together with the Causes and differences; then to subjoin the Curatory method, and to illustrate it with some more rare Cases and Observations.

What things belong to its Pathology.

As to the former, as all pain is a hurt or violated Action, or a troublesome sensation or feeling, depending on a Convulsion, or a Corrugation of the Nerves, the Subject of the Headach are the most nervous parts of the Head, that is, the Nerves themselves, as also the Fibres and Membranes, and such as are more and most sensible, seated both without and within the skull. But the parts of this kind, which are affected with pain, are first the two *Meninges*, and their various processes, the Coats of

The Subject of this Disease.

The formal Reason of it.

the Nerves, the *Pericranium* (or skin compassing the skull) and other thin skinny Membranes, the fleshy Panicle of the Muscle, and lastly the skin it self. As to the Brain and Cerebel, and their Medullary dependences, we affirm, That these Bodies are free from pains, because they want sensible Fibres, apt to be wrinkled and distended: the same, for the like reason, may be said of the Skull.

2. But whensoever pain is excited any where about the nervous parts of the Head, its formal reason consists in this; That the Animal Spirits being drawn one from another, and put to flight, cause the containing Bodies to be pulled together and wrinkled, and so stir up a troublesome sensation or feeling: But that which so distracts the Spirits, that from thence a troublesome feeling arises, is some impropportionate thing, rushing upon the Spirits themselves, or on the Bodies containing them, which entering the Pores of, and spaces between, the Fibres, pulls them one from another, and so drives the spirits dwelling there into disorder.

The differences and kinds.

Pain is either without, or within the Skull;

Or universal, or particular.

This either before, behind, or on the side.

Many other differences of it noted;

3. As to the differences of the Headach, the common distinction is, That the pain of the Head is either without the Skull, or within its cavity: The former is a more rare and a more gentle disease, because the parts above the Skull are not so sensible as the interior *Meninges*; nor are they watered with so plentiful a flood of Blood, that by its sudden and vehement incursion, they may be easily distended, or inflamed above measure. Secondly, The other kind of Headach, to wit, within the Skull, is more frequent, and much more cruel, because the Membranes, cloathing the Brain, are very sensible, and the Blood is poured upon them by a manifold passage, and by many and greater Arteries. Further, because the Blood or its Serum, sometimes passing thorow all the Arteries at once, both the *Carotides* and the *Vertebrals*, and sometimes apart, thorow these or those, on the one side or the opposite, bring hurt to the *Meninges*, hence the pain is caused that is interior; which is either universal, infesting the whole Head or its greatest part; or particular, which is limited to some private region; and sometimes produces a Meagrim on the side, sometimes in the forepart, and sometimes in the hinder part of the Head.

There are many other differences of this Disease, to wit, That the Pain is either light or vehement, sharp or dull, short or of continuance, continual or intermitting; its approaches sometimes periodical and exact, sometimes wandring and uncertain. Also by reason of the Conjunct Cause, which (as shall be declared by and by) sometimes is the Blood, sometimes certain excrements of it, as either the Serum, or nourishing juice, or vapours, or wind; sometimes it is the nervous liquor, sometimes a congression or striving of it with the bloody liquor: The Headach may be called, either bloody, and that either simple, or else serous, vaporous, or otherways excrementitious; or else Convulsive, from the humor watering the nervous Fibres, and irritating them into painful Corrugations.

Of which the chiefest is, that it is either occasional, or habitual.

The reason of the former unfolded.

The habitual Pain of the Head hath always a more remote Cause, besides the evident Cause.

The evils, or the weak Constitution of the affected part, and the ease flowing in of the morbid matter, concur to this more remote cause.

The Parts of the Head predisposed, and their vices, viz. an evil or weak conformation are noted.

Concerning these, that we may proceed methodically, we shall rehearse in a certain order, the various kinds of this Disease, with their Causes; and it seems good, that we distinguish the Pain of the Head to be either accidental, or occasional and habitual: The former is wont to be excited without any foregoing cause, or previous disposition, by the solitary evident cause, as when an Headach happens almost to all men after the drinking of Wine, Surfetting, lying in the Sun, or vehement exercise, also in the fits of Feavours; to wit, forasmuch as the Blood being incited, more than it was wont, and boiling up immoderately, very much blows up and distends the Membranes it passes thorow; yea the Serum and Vapors, copiously sent forth, from it, then growing hot, and rushing on the Membranes, pull and provoke the nervous Fibres.

Secondly, The habitual pain of the Head, hath some *procatarrick* or more remote Cause fixed somewhere, by reason of which it is troubled, either constantly or often; so that though it sometimes intermits, yet it often returns of its own accord, and is excited also upon every light occasion: but this, whether it be continual or intermitting, hath neither always, nor only, the Suffusions or too great Evaporations of the Blood or Serum, for the Conjunct Cause, (although these are often present, where notwithstanding they are rather instead of the Evident Cause, than the Conjunct) but beside, an evil *procatarrick*, or a certain predisposition, is always affixed to the part affected, or wont to be distemper'd; by reason of which, the aforesaid Causes, also the inordinations of the Nervous Liquor, and the meeting and growing hot of it with the bloody Serum, or the Nutritious Juice, raise up the fits of pains.

Although the more remote Cause of the Headach be manifold and diverse, so that its several kinds can scarcely be number'd, yet for the constituting it, these two, to wit, either one or both of them, do chiefly or for the most part lead the way, viz. First, The evil or weak Constitution of the affected part: Secondly, Then, because of the more ease and ready heaping up of the Morbid matter in it.

As

As to the former, the parts of the Head obnoxious to pains, are the Nervous Fibres, belonging to the Membranes, Tendons, the Muscous flesh, and other sensible Bodies; the Morbid provision of which consists in their evil conformation or debility.

Of these, that the former is sometimes innate and hereditary, appears from hence, *The former often times is innate and hereditary* because the Disease is often delivered from the Parents to the Children: and seems to be done chiefly by this means: because the covering of the Head being made more thick, or more close than it ought, neither the humors, nor the vapours do easily pass thorow; wherefore being by these restrained, and hindred in their Motion, and so heaped up, the *Meninges, Pericranium*, and other sensible parts, being too much stuffed, or inflated, or hauled, receive pains: to which happens, that sometimes, by reason of the original intemperance of the Brain, the Humors or Vapours about the parts, hanging like an arch over it, are variously heaped up together.

2. But it more often comes to pass, that the Vices of an evil Conformation, by which these or those parts of the Head are disposed to the Headach, are contracted anew, and that by a various kind of production: for sometimes by Cold taken, by reason of the Northern winds, Snow, or Rain, the Pores of the skin in some region of the Head, yea and the nervous Fibres themselves, are so closed up, or otherwise perverted or weakned, that they are not able to bear the outward air, nor the agitations of the Blood or Humors, but presently the Headach arises. *But more often is contracted anew: And chiefly from Cold,*

Nor is the predisposition of the Headach less rarely produced, in the disorderly using the six not natural things. For the Blood being stirred up above measure, upon any cause whatsoever, impresses by its boyling up, or by the insinuation of the Serum or Vapours, a breaking of the unity in some nervous parts, or some other sort of hurt; for which reason, as there is a present Headach, by and by stirred up, so afterwards there is a disposition to the same, upon every light occasion. But oftentimes a disposition to the Headach not easily blotted out, is induced by a vehement Passion, Surfeit, Drunkenness, also by a blow, wound, or contusion of the Head: so that either the proper or excrementitious humors being heaped up, and standing in those parts, being afterwards moved of themselves, or growing hot with other inflowing juices, stir up inflations, or painful haulings or pullings. Yea, I have known Inflammations, Imposthumes, Wheelks, *Scirrhus* tumors growing to the *Meninges* with the Skull, and other Diseases of an evil conformation, excited in the Membranes of the Brain; by which, at first for a long time, frequent Headaches, and most cruel, and then afterwards a sleepy and deadly distemper hath been induced; the cause of the Disease not detected, but after death by *Anatomy*; and indeed it is to be suspected, that inveterate and pertinacious pains in the Head, which return, and dayly become more tormentive, in spite of all Remedies, depend upon some such invincible cause. *Also by reason of the inordinations in the six non naturals. By accident. From internal Concretions.*

2. Not only an evil conformation, or the breach of unity, but also sometimes a meer weakness or enervation, renders some parts of the Head obnoxious to the Headach; for when as the Fibres are somewhere so infirm, that they are neither able of themselves to rule the proper humor, nor to resist the incursions of a strange humor; the part so disposed, by reason of any light occasion, is moved into painful wrinklins: These kind of debilities of the Fibres, sometimes external accidents, as the excess of cold or heat; sometimes also errors in Dyet or living, as Surfeit, Drunkenness, and especially sleeping at noon; moreover great *Catarrhs*, and a long lodging of a sharp Serum are wont to bring in. *2. The debility of the distempered part is also a more remote cause of the Headach; Which outward accidents and errors in feeding and other Distempers, are wont to produce. The other part of the more remote Cause, secondary and moveable, consisting in the flowing in of the morbid matter.*

So much for the primary more remote cause of the Headach, which is also fixed and rooted: The other cause of it, secondary and moveable, consists in a ready and easie heaping up of the Morbific matter about the predisposed parts, from which come the fits of pains, and their approaches: But as the matter is manifold, it is wont to be heaped up after a diverse manner, and to excite pains which affect after a diverse sort: This, as we have said, is either the Blood, or its Serum, or the nourishing Juice, or the nervous Liquor. Every of these being variously disposed, or imbued with feculences or dregs, are by degrees heaped up about the predisposed parts of the Head, sometimes before the fit; and sometimes, that coming, they are plentifully cast down. But sometimes one only humour with its plenitude and acrimony, distends or provokes the sensible Fibres; sometimes more meeting together, by their mutual growing hot, pull or haul the Fibres, and so stir up painful Convulsions. We shall briefly take notice of the several kinds of these, with their signs, and the manner of their being made. When therefore a part of the Head, as chiefly the *Meninges*, or some region of the *Pericranium*, is predisposed, by reason of an evil conformation or debility, to the Headach; the approaches or fits of the Disease are wont to be excited, by reason *This matter is either the Blood, or its serum, or the nutritious, or nervous Juice. Which sometimes alone, sometimes meeting together, irritate the predisposed parts.*

How the Blood
excites the
Headach.

son of the various incursions or coming together of the following humors, sometimes of this, sometimes of that humor, and sometimes of many together.

1. Sometimes the Blood it self being incited into a more rapid motion, and boiling up into the Head, is straitned or stopp'd in its passage about the predisposed places, and from thence, being by and by heaped up there, distends the Vessels, greatly blows up the Membranes, and pulls the nervous Fibres one from another, and so brings to them painful corrugations or wrinklins. For this reason those obnoxious to the Headach, are forced to shun all occasions by which the Blood should grow hot above measure, as drinking of Wine, Exercise, Baths, &c.

2 How the
Serum.

2. The Serum being more copiously heaped up in the bloody Mass, oftentimes conceives a sudden Flux, either of its own accord through meer fulness, or stirred up by an evident cause, and so presently running forth from the Blood doth not only rush into the Lungs, but very often into the Head, and being poured upon its Membranes or Muscles, is copiously heaped up about the parts predisposed to the Headach, and there induces painful Corrugations and Inflations. Further, the Serum carries with it infestous Recrements, as sulphureous, saline, sharp, acid, bilious, or melancholic, or of some other kind, and fixes them to the nervous Fibres, which cause an acute or dull, a shorter or a longer pain. The Headaches arising by reason of this kind of remote cause, infest more grievously in the Winter time, in a moist Air, and in a Southern Wind: Moreover, *Catarrhs* of the Face, Mouth, *Larynx*, and of other parts, oftentimes accompany this Disease.

3 How the nu-
tritious Juice.

3. The nourishing Juice, or fresh *Chyme*, being carried from the Blood to the solid parts, and laid upon them, by reason it becomes improporionate to some parts of the Head evilly disposed, is wont to excite periodical fits of the Headach. For this provision being laid up near some nervous Fibres, because it cannot be assimilated, begins to trouble them or burthen them, after some stay, and at length provokes them into wrinklins to expulse that which troubles them. An Headach proceeding from such a cause, as I have observed in many, doth dayly come at so many hours after eating, and continues a like space of time; yea the times alter according to the manner of taking their repast, both as to the quality and quantity, and so also the fits of the pains are wont to vary.

4 How the ner-
vous Liquor is
a cause of this
Disease.

4. The nervous Liquor is a cause of pains, by its inordination, as oftentimes in other parts, so also not seldom in the Head; for this either degenerating from its temper, or being imbu'd with dregs or filthiness, does not pass thorow so freely the nervous Fibres, but is apt to stagnate, and to be heaped up in them to an irritative fulness: and that chiefly within the Fibres made weak beforehand, or of an evil conformation (such as are sometimes the Membranes of the Head) because in these predisposed, the watering Liquor being hindred in Motion, easily arises to an aggravating or provoking fulness; so that the Fibres being so filled, like the stomach too much crammed, enter into Convulsions and painful wrinklins, for the putting away their contents, nor do they cease from them, till they are freed of their burthen; which notwithstanding, afterwards being heaped up again, sometimes sooner and sometimes later, cause from thence others, and so again other fits of pains. The Headach arising from such a cause, springs oftentimes without any notable turgescency of the Blood, and gently and as it were of its own accord, without any errors in dyet or living; yet sometimes it may sooner arise by reason of disorders in the non-naturals, and other accidents; This is wont to come more often in the Morning, and after long sleeping, when the nervous Fibres have drunk in this humor more largely.

The Headach a-
rising from the
fault of the ner-
vous Liquor in-
fests chiefly in
the Morning.

5 How many
humors meeting
together, and
mutually grow-
ing hot, stir up
Headaches.

In the aforesaid Headaches, the Morbifick matter is made up for the most part of one singular humor, and so the fits of the pains are something more gentle, and oftentimes sooner pass over. But there is another Cause of this Disease, when two humors (like divers kinds of Salts) meet together, and grow mutually hot, and so from the strife of dissimilar particles, the Fibres are very much pulled, and moved into very acute and cutting pains, and are most commonly longer infested with them. In this case one of the champions is always the nervous liquor, but the other, either the serous water or the nourishing juice. We exempt the Blood, because it only washes the passages of the Nerves, and does not enter them deeply; but the nervous humor, by reason of the vices but now recited, sometimes of it self, pulls the containing Fibres, and provokes them into painful Convulsions. If that another humor, either the Nutritious or Serous, (for both of them are wont to be guilty) being little of kin, be plentifully poured upon this so predisposed, and copiously heaped up within the Fibres; presently all the particles being raised up, strive among themselves, and so by a mutual effervency, notably distend and haule the Fibres, that from hence from their being long and greatly wrinkled, most sharp and long remaining pains are induced. Whether it be this

this or that humor, meeting with the nervous juice, that causes the Headach, may be easily known from the proper irregularities, above described, of either peccant humor by it self.

By what means, and for what more remote causes, the humors, either Nutritious or Serous, offend, as often as meeting with the Nervous humour, contained within the Fibres, move the fits of pains, shall be declared anon: in the mean time, I think it sufficiently appears, that the more frequent and habitual Headaches are produced chiefly by the fault of the nervous liquor, because this is most intimate both with the Fibres themselves, which are wrinkled, and the Spirits which are moved into painful distractions; also because the pains of the Head sometimes arise without any disorder or tumult of the Blood, Serum, or nourishing Juice, and these being emptied or allayed, after what manner soever, oftentimes the Headach most pertinaciously continues.

The habitual Headach depends chiefly upon the fault of the nervous humor.

But concerning the nervous Liquor, when it is the cause of the Headach, we observe that its fault is sometimes universal, and sometimes private: for sometimes it doth acquire its evil from the distempered part: to wit, forasmuch as being constrained to subsist or stagnate within the Fibres, hurt by their conformation, it is so perverted that at length being infested, fermenting either by it self, or with some other humor, it irritates them into painful Corrugations: Yet sometimes, and especially in the more grievous Headaches, we may suppose that the whole Mass of the nervous Liquor is in fault, but the nervous parts of the Head partake of its evil, before any others in the whole Body; because these are the chief and nearest springs of the nervous Liquor, and are also highly sensible: wherefore, the nervous Liquor, when ever it is vicious, either swelling up of its own accord, or growing hot by another humour being poured unto it, within the *Meninges* and other Membranes of the Head, more than in the other parts of the Body, becomes painful. The thing appears to be so, because a long and grievous Headach is wont to be Cured, not so much by Remedies applyed or proper for the Head, as by those which restore the *Crafsis* or Constitution of the nervous Juice, and the bloody Mass; and such are *Chalybeats*, or Steel Medicines, and *Antiscorbuticks*, or Medicines against the Scurvy. Which certainly argues that the nervous Liquor, where-ever it is in fault thorow the whole Body, chiefly punishes the parts of the Head.

The fault of the nervous liquor is either universal, or particular, proper to the place distempered.

Thus much for the causes of the Headach, both the procatartick or foregoing, and the Conjunct: there yet remain others more remote, called Evident, which raise up the former, and provoke them into act, or the painful means of affecting. But they are of a various kind, and of a divers operation: to wit, Whatever things are apt, first, to transfer the Morbific matter from another place into the part affected; or secondly, to move it before lodging in it; or thirdly, and lastly, which impress on the Fibres themselves, predisposed to painful Convulsions, this Distemper, by the consent of the other parts as far off, they belong to this rank.

The more remote or evident Causes of the Headach are noted.

As to the former, the Blood and its inmate humors, to wit, the Serous and nutritious; also the bilous, acid, and otherwise vicious recrements, are apt to be moved from various Causes, and to be transferred into the Membranes of the Head, viz. many accidents from without ordinarily effect this, as great and sudden mutations of the Air, or the season of the year, excess of heat or cold, or of moisture, plentiful feeding, drinking of Wine, Bathing, immoderate Venus, violent passions; yea many other occasions sufficiently known, and to be avoided by all subject to Headaches. Further, these humors sometimes swell up of their own accord, and without any external Cause, or other ways evident, being moved, drive themselves forward into the Head: in which place, when they come, and settle upon the Fibres before indisposed, though they constitute a part of the Conjunct Cause, yet they, when they are first in motion or flux, become the means of the Evident Cause. Wherefore, when we have first unfolded, by what means the Blood, with its contents, being carried to the distempered Membranes, stir up Headaches; we shall then shew by what means, and upon what occasions, the same humors are wont to be moved, and to be snatched into the Membranes.

Of which sort are, first, those which move the morbid matter flowing from another place; to wit, either the Blood, or Serum, or nourishing juice, and stir it up within the places affected of the Head.

The Blood and its contents, in Headaches are sometimes the means of the Conjunct, sometimes of the Evident Cause.

And first the Blood growing hot of its own accord, and by reason of the strife, and intestine motions of its particles, imparts its trouble to the Head: Its frequent and wandring turgency or boiling up, happens not only in the fits of Feavours, but also without any cause or suspicion of disease, which in others scarce perceivable, those obnoxious to the Headach sufficiently take notice of and feel; neither doth the blood only bestow the hurt to the Head, from its own proper provision, but receiving it elsewhere, sends it thither. Oftentimes the Blood receives the incongruous matter from the Stomach, Spleen, Mesentery, Liver, and other parts, or Inwards, infestous to it self or nervous Stock; which growing hot a little time after, that

For what Causes the Blood is wont to be moved, and to bring hurt to the distempered Head.

The Blood delivers to the head the morbid matter received from any other part.

A Flux of the Serum sometimes from meer fullness.

Sometimes from other Causes.

Sometimes the watry humor suffering a flux offends the Head.

Hence in those that have the Headach, as in Convulsive Diseases, there is often a clear and copious Urine.

The recrements of other parts, often carried violently to the head with the Serum.

The evacuation of the Serum thorow its right ways, being suppressed, brings its flux to the Head.

3. The nutritious juice sometimes the cause of the Headach, either,

1. Because it is carried with the Blood into the Head.

that it might extrude or thrust it forth; it pours it upon the Membranes of the Head, and so produces the Headach, commonly called Sympathetick, viz. by a consent excited in other parts; which kind of Distemper being transmitted from other parts to the Head, sometimes also it happens after another manner, as shall be by and by declared.

When the Mass of Blood abounds with Serum, it is sometimes excited to the putting it off by meer fullness, wherefore it conceives a flux, or as it were a certain melting, to wit, by which the thin and watery part may be separated from the thick and bloody. Then, because the Blood becomes more diluted in its swelling up, and passes more swiftly and more copiously thorow the Arteries, than can be carried back by the Veins, almost all that is serous is sent away by the spaces between the Vessels, being poured sometimes on these parts, and sometimes on those, as falling down in many places, it causes tumors or Catharrs, so lying on the Membranes of the Head, it stirs up fits of pains.

But the serous heap, from many other causes sweating forth from the Blood suffering a flux, rushes on the Meninges and the Pericranium, and causes in them most troublesome Headaches. A sudden Constipation or closing of the Pores by Cold or Wet, almost constantly produces such a Distemper in most, obnoxious to this Disease. Sharp and thin Wines, Cyder, yea and Beer, that by reason of its sourness is apt to ferment, because they fuse the Blood, and precipitate its serosities, are forbid to those troubled with Headaches, as so much poison: And lastly, whatever is wont to cause a Flux in those troubled with the Gout, the same also for the like reason causes it in these, for the rising Serum, in either, flows to the distemper'd part, where it oftentimes grows hot with the nervous humor.

Further, not only the meer and simple Serum of the Blood, dropping forth upon the Membranes of the Head, stirs up pains, but sometimes other humors joyning together, and by this passage being admitted to the distemper'd part, encrease the tragedy of the Disease; it often happens, that a thin and watery humor doth suddenly flow forth from the Lymphic Vessels, the Glandula's, and perhaps from the Passages and Pores of the solid parts (in which it is gathered together) and is poured forth into the Blood in the Veins; from whence presently passing thorow the bosom of the Heart, and being confused with the Arterious Blood, and by that soon separated, is cast back by any way it can find; therefore, being partly sent away by the Reins, it causes a flowing down of a clear and copious Urine, also sometimes partly redounding on the Brain or Nervous Originals, produces Sleepy or Convulsive Distempers, as we have elsewhere shown. Yea sometimes, a certain part of the same limpid humor, being snatched with the Serum into the Membranes of the Head, raises up fits of a most cruel Headach: For indeed, I have observed in many, a watry and very plentiful Urine, either to precede or accompany the fits of this Disease.

But we may believe other manner of recrements, of the other parts, viz. bile from the Liver, black bilary feculencies from the Spleen, and perhaps incongruous humors from the Stomach, Reins, Pancrace, &c. are supped up by the Serum of the Blood, and deeply boiled with it, by which, whilst it is infected, it more readily conceives Effervescencies, and so rushing impetuously into the Cephalick Vessels, and there fermenting with the nervous Liquor, brings forth Convulsions, and painful and very troublesome pullings or haulings.

The serous heap, whether it be simple, or as we have shown, complicated, is sufficiently infestous to the Head, whenever its usual evacuation, thorow its due and accustomed ways, is hindered: viz. whether if the Pores being bound up, transpiration be inhibited, or by reason of the evil distemper of the Reins, an Evacuation by Urine is not copiously performed; either defect greatly punishes those subject to Headaches. Further, the Membranes of the Head are oppressed, by reason of the passages of the Blood being obstructed in other places: for if the lower or middle parts of the Belly, and especially the Liver and Lungs, are troubled with an obstruction, so that the Blood can scarce pass thorow in those places, its more full torrent is directed into other parts, and especially towards the Head; so that for this Cause, I have known to have followed, not only Headaches, but also soporiferous or sleepy, and sometimes deadly distempers.

3. As the Serum in the bosom of the Blood, so the nourishing Juice, that is the fresh Chyme made out of the Aliments, lodges there too, and is circulated with it, and forced to follow its inexorbitances, being as it were in the current of the same River. Wherefore, when the Blood, presently after eating, is carried impetuously or inordinately to the Head, and the nourishing Juice being half-Concocted or depraved, is fixed there to the Membranaceous Fibres, it causes painful pullings or haulings to follow; for

for hence it is, that exercise, bathing, violent passions, reading, or any serious intention of the Mind, upon a full stomach, hurt those troubled with Headaches.

Sometimes the nutritious Juice is not presently or easily mixed with the Blood, but being carried fresh to it, by and by stirs up a turgency, so that many, constantly after eating, are troubled with an high Colour, and oftentimes also with an Headach. This commonly, but amiss, is imputed to the obstruction of the Liver, when indeed it proceeds from an evil disposition of the Blood, hardly bearing the mixture of the fresh Chyme. Wherefore, such a distemper, follows for the most part dangerous Favours, and especially the Small Pox, and sometimes great Surfeits.

2. Because not being agreeable to the blood, it stirs up its effervescency.

4. There yet remains another sort of Evident Causes, (to wit, by which the leading Causes, or predispositions to the Headach are actuated) plainly different from the former irregularities of the Blood, Serum, and nourishing juice; to wit, when Headaches very often most terrible, follow, by reason of Convulsions, begun in other parts, and from them continued to the Head. 'Tis an usual thing for a certain sense, or feeling, of a Formication, or little pricking, to creep forward from the *Hypochondria*, as also from the region of the Stomach, Mesentery, Womb, yea sometimes from the Members or outward parts, to the Head, and by and by sometime after to excite a pain that will last for a good while. This kind of Distemper, which is wont oftentimes to be the forerunner of the *Vertigo*, also of the *Epilepsie*, or the *Apoplexie*, is commonly believed to be the ascent of Vapours; when indeed it is only a Convulsion, begun in the extremity of some Nerve, which creeping upward towards its original, and then coming to the Skull, for as much as it either is communicated to the parts within the Head, or to the *Meninges*, either one or both of them, it stirs up Convulsions or pains. Which passions notwithstanding, follow this Formication or tingling, brought from elsewhere, sometimes as a sign, and sometimes as the cause. We have in another place largely enough unfolded the reason of the former, to wit, it being shown, that when the Morbifick matter possesses the beginnings of the Nerves, or the nearest parts to them in the Head, a Convulsion oftentimes beginning from the ends of the same Nerves, being carried thence upwards towards the places first distemper'd, ascends as it were by a creeping forward: wherefore not only upon the *Vertigo*, but upon the Headach, a Vomiting comes very frequently.

Sometimes the evident causes of the Headach are Convulsions somewhere begun and continued by the passage of the nerves, into the Head.

Convulsions beginning afar off, are sometimes signs of an Headach shortly to follow.

But further, an Irritation in some distant Member or Viscera, is sometimes the occasion, and in a sort the cause of the Headach; to wit, when the Morbifick matter is heaped up, even to a fulness of Turgency in the part of the Head already disaffected, there is need only of a light Vellication or pulling of the Containing Fibres, that this matter being stirred, should cause a fit of the Disease; to which movement, it often suffices, that by an intimate concert of some distant Inward, as the Ventricle, Spleen, or Womb, with the Head, the nervous Fibres should be pulled or hauled; for presently from thence, the trouble being communicated by the Nerves, some Membraneous Fibres of the Head, being evilly disposed, and burthened with the Morbifick Matter, begin to be strained and wrinkled, and so when the Mine of the Disease is moved from its moved Particles, the Fibres are urged into grievous and continual Corrugations.

Sometimes also the cause of it.

Headaches that seem to begin after this manner from the Viscera, and commonly called Sympathetic, are wont to be ascribed to Vapors, viz. by supposing a Mine of the noxious humor to lye hid in some Inward, from which being moved, whilst the Effluvia ascend into the Head, and there sharply pierce thorow and pull the nervous Fibres, pains are excited. We have already so plainly refuted this doctrine, that there is no need here to bring any other reasons to oppose it. But in the mean time, let us inquire whether pains of the Head do not arise also by other means, besides a Convulsive communication thorow the Nerves, by reason of the Morbifick Cause lodging in the Stomach, Spleen, and other places.

Convulsive Headaches seem to arise so from the Viscera, not from Vapours.

Concerning this, we may suppose, that Matter oftentimes degenerate, is heaped up in remote parts, which carries its hurt to the Head, by the passage or Circulation of the Blood. 'Tis a usual thing for Corrupt humors, viz. sometimes sharp, sometimes acid or austere, to be heaped up in the Ventricle; Bile in the Liver, atrabiliary or melancholic dregs about the Spleen, yea and other sort of degenerate Matter about the Mesentery, Womb, or other parts: from which being heaped up to a fulness of swelling up, a Fermentative *Miasm* or Infection is fixed to the Blood; from which, that, being as it were imbued with rage, impetuously grows hot, and partly by its swelling up, and partly by transferring what is incongruous into the Membranes of the Head, stirs up fierce and cruel fits of pains.

But this sympathetic Distemper perhaps proceeds elsewhere, by reason of an evil ferment, communicated to the blood.

As to the Ventricle, that it is so, some obnoxious to this Disease have plain experience. Because some of them, after the Bile or Choler flowing in the Stomach,

So sometimes it seems to be caused from the ventricle.

and others after a noted soreness, and ravenous hunger, most certainly expect a fit of the Headach. The reason of which seems partly to be, that those contents of the Ventricle being supped up by the Blood, make it hot, and stir up in the same a Cephalic Turgency or swelling up; moreover, from this kind of sharp Vitriolick, or otherways infestous matter, being heaped up and moved within the Stomach, a Convulsion, or Corrugation very troublesome, is impressed on the Fibres and the extremities of the Nerves there inserted, which immediately being continued into the Head, by the passages of the same Nerves of the eighth pair, and of the Intercostal, is communicated to the Membranes, and the nervous Fibres, predisposed to painful wrinklins.

The Head and the Stomach intimately conspire, and mutually affect one another.

By reason of the same Reciprocal Communication, between the Stomach and the Head, a nauseousness and Vomiting, as we said but now, follows upon the Headach, viz. the Membranes being stirred up into painful wrinklins, by the Morbifick matter (even as 'tis wont by a blow or wound) and transferring the evil by the passage of the Nerves to the Ventricle, guiltless of it self, a vain endeavour of Vomiting sometimes arises, nothing remaining within the Ventricle, that should be cast forth: yet sometimes, from a cruel shaking of the Inwards, in striving to Vomit, the Gallish or Pancreatic humor, either one or both of them, being thrust forth into the Duodenum, and cast forth by Vomit, is ignorantly taken for the Cephalick matter.

2. How the Head-ach seems to arise from the Spleen.

2. The pains of the Head are wont to be imputed no less to the Spleen, than the Ventricle; and indeed 'tis ordinarily observed in Hypochondriacks, obnoxious also to this Disease, when a Pain, Inflation, a Rumbling, or some other Perturbation of the distemper'd Spleen, happens in the left-side, that the Headach, as if raised up by it, by and by frequently succeeds; hence, presently 'tis the voice of the people, that these Vapours being sent forth from the disturbed Spleen, stir up the pain of the Head: But indeed, we may grant that the Headach arises sometimes from the default of the Spleen, yet reject this opinion, that it ought for this cause to be imputed to Vapors, but indeed either to an evil Ferment, transmitted into the Blood from the Spleen, or from a Convulsion, from thence communicated to the Head, by the Nerves: because in the Spleen evilly affected, the Melancholic humor being degenerate, sometimes into a Vitriolic Nature, sometimes a biting, sometimes a sharp, or otherways infestous, is oftentimes heaped up, which of its own accord being shaken forth, by reason of plenitude, or occasionally by reason of some perturbation, and being confused with the Blood, impresses a Fermentation upon it, by which its Liquor rushing by it self on the Membranes of the Head, or growing hot with the nervous Liquor, causes painful pullings or haulings. Further, it is no less probable, that sometimes a Convulsion being excited in the nervous Fibres, which are very much disposed about the Spleen, brought thence by the passages of the Nerves of the wandring and Intercostal pair, and continued to the Head, impresses the like Distemper to the Membranes predisposed to it.

The like reason is for this Distaste, arising from the Liver, Mesentery, or Womb.

The kinds of habitual Headach are noted. It is either, Continual,

3. A reason may be also rendred, according to the same Pathology, to wit; either from an evil Transmission of the Ferment, or a continuation of the Convulsion, for Headaches which are said to be raised up by consent, from the Liver, Mesentery, the Womb, and other parts.

The habitual Headach, the *Axiology*, or the Reason of which, we have already sufficiently handled, is yet divided into certain kinds, to wit, it is either Continual, or Intermitting; but the periods of this are sometimes determined to a certain time, and are sometimes wandring and uncertain: we shall speak briefly of each of these.

1. Sometimes therefore it happens, that some are afflicted with a Continual pain of the Head, to wit, for many days or months, little intermitting, unless when sleep helps; in which case we suppose, that there is not only present a Procatartick or leading cause, but also a Conjunct, somewhere fixed and constant. For besides that the parts affected, or that are wont to be affected, are weak, and their watering liquor much depraved, is apt to stagnate, or to grow hot with other humors; there is moreover oftentimes excited in them, a breaking of the unity, to wit, an Inflammation, a red and painful swelling, a Scirrhus tumor, or Imposthum, or of some such kind, about which, whilst the humors of divers kinds do meet together, and are heaped up, there arise almost perpetual pains, by reason of the nervous Fibres being continually pulled or hauled. These kinds of Headaches, do not rarely end in sleepy distempers, and at length deadly; for when I have opened the Heads of many dead of these Diseases, the signs or footsteps, declaring the aforesaid kinds of Morbifick causes, have appeared; some examples of these shall be added hereafter.

or Intermitting.

2. The habitual Headach, is for the most part Intermitting, whose fits, as they are certain and Periodical, or coming at a set period of time, are wont often to return in the space of half a day and night, or once in twelve hours. Some more rare cases I have known, which exactly repeating the Fits, came every other day, yea once in a week

week, or a month. It is an usual thing, for Headaches, that seem to be driven away, to return again about the Equinoxes or Solstices; to wit, because at these times, the Blood and Humors conceive greater Turgences or risings up, than are wont, and therefore are more apt to grow hot with the watering Liquor of the nervous parts of the Head, and to renew the wonted fits of pains. But when about these times of the year, Headaches return, they are not prorogued by a longer accession for a great while, but for the most part, having gotten subordinate periods, they are wont to infest at some certain standing hours, for the space of twelve hours.

The Fits of the intermitting, either periodical, or certain;

When therefore a Periodical Headach hath its daily fits, for the most part the reason of these, as of Intermitting Feavors, ought to be sought from the fault of the Morbifick Matter, arising to a plenitude at a set time, and then growing hot. For it may be supposed, that the proper Liquor is perverted somewhere about the Membranes of the Head, and the nervous Fibres evilly disposed, or doth not well pass thorow them; wherefore, when the nourishing Juice, placed also on the same parts from the Blood, is not presently assimilated, nor doth well agree with the other humor; at length, from both of them heaped up together and disagreeing, a mutual growing hot arises, and from thence a painful pulling of the Fibres: but for that the fits of the pains, are not always at the same distance after Eating, but arise in some sooner, and in others later, and sometimes before sleep, and sometimes after; the cause is, that partly the offices of Concoction, and distribution of the Aliments, are performed sometimes sooner, sometimes later; and partly, because in these the nervous Liquor, and in those the nutritious Juice, is most in fault: wherefore, as the fulness of this happens sooner, and of that later, so the times of the fit vary: we shall illustrate these afterwards, with observations made concerning the cases of sick persons.

3. When the fits of the intermitting Headach are wandering and uncertain, the *Procatarxis*, or foregoing cause of the Disease, is neither great nor constant, nor is the Evident Cause continual: Wherefore, when that either cause is oftentimes absent, and one of them often wanting, the fits of the Disease are not tyed to certain times, but in some, they are as it were by chance and accidental, in others, in whom a predisposition to this Distemper is a little more firmly rooted: the pains of the Head more frequently molest, and are ordinarily excited, by reason of various occasions, yea and for some, they are wont to be most certainly expected. The reasons of the fits so variously happening appear clearly above, from the *Ætiology* delivered of this Disease; besides, the whole business shall be illustrated anon, by examples.

or uncertain, and wandering.

CHAP. II.

The Prognostick and Cure of the Headach.

SO much for the Causes of the Headach, which being so various and diverse, and their Series so perplex'd and intricate, it will not seem easie to keep one Method concerning all cases of the Sick, whereby we may be led presently to the true knowledge and Cure of this Disease; nor is there less difficulty concerning its Prognostick: But common experience affords some observations, from which it may be gathered, that the Cure of this Sickness is sometimes easie, sometimes difficult, or scarce possible; so that from thence it may be lawful to declare the event of the Disease, either safe, or very dangerous, or wholly uncertain.

The prognostick of the Headach, shews it easie or difficult to be cured; also,

the event of the Disease safe or dangerous.

Truly, if any one enjoying formerly a perfect Health, should fall into something a cruel Headach, and of some long standing; by reason of a more strong Evident Cause, as drinking of Wine, Surfeit, Venus, immoderate Exercise, or such like; forasmuch as the fore leading Morbid Cause is not as yet firmly laid, we may pronounce such a Distemper to be safe enough, and not pertinacious.

By what signs we may pronounce it safe, and easie to be cured.

But if the Morbifick disposition should be inveterate, so that for many years the fits repeat often of their own accord; and upon every light occasion, this, though not dangerously sick, yet we predict it not easie to be Cured. Further, the Cure will be yet more difficult, if Hypochondriack or Hysterical Distempers, oftentimes troublesome, are oft wont to excite the Headach at every turn, or if the taint of an inveterate Venereal Disease be rooted in any distemper'd part.

By what difficult.

If that the pain of the Head shall be not only inveterate, but almost continual, that we might suspect it to arise from an Inflammation, or a Scirrhus Tumour, an hot Swelling,

By what scarce possible.

ling, an Imposthum, or Worms, there is none or very little hope of Cure; especially because the sick will refuse great remedies, as Salivation, or opening the Skull; which if they be made use of perhaps at any time with any fruit or success, yet the former and this two for the most part are wont to be tedious to the sick, before they can effect any thing worth the trouble and expectation.

By what, dangers.

The pain of the Head either Continual or Periodical, if it be great, and hath joyned with it a Vertigo, Vomitting, or other Convulsive or Soporiferous Distempers, shews a suspicion of great danger: even which often passes into a deadly *Apoplexie*, and not seldom into an *Epilepsie*, Palsie, Blindness, Deafness, and other funestous and incurable Diseases.

The Curatory method of the Headach comprehends many Indications, and those of a various kind, according to the manifold Species, Causes, and differences of this Disease, which will not be an easie thing here to set down, and rehearse in order.

Accidental Headach easily cured.

The accidental Pain of the Head, with the remote Evident Cause, and its consequences, ceases for the most part of its own accord, or at least is taken away by letting of Blood, Rest, and Sweat.

The habitual affords more indications.

The habitual Pain, by reason of the diversity of Causes, viz. both the *Procatartick*, and also the *Conjunct*, suggests also different intentions of Healing; we shall here briefly touch upon the chief of these, and to which all the rest may be placed.

Two chief scopes of Cure.

In every habitual Headach, whether Continual or Intermittent, there are two chief scopes or intentions of Cure to be met with; to which all the other Curatory intentions ought to be aimed, and by which we should provide against either Cause of the Morbid *Procatartix*.

1. To cut in two the Bed or Root of the Disease.

1. To wit, in the first place, that all the Tinder or inkindling of the Disease be cut off, you must endeavour, that both the matter flowing to the distempered places of the Head, or those evilly disposed, or apt from thence to flow to them, be suppress'd, or called from thence to another place; then moreover, that Convulsions in other places excited, and that are wont to be propagated from thence into the Head, be prevented.

2. To root out the Conjunct Cause.

2. Then secondly, it must be endeavour'd (if it may be done) that the Disease it self, or its *Conjunct* Cause may be rooted out, that the places of the Head predisposed to Headaches, (whether they be only enfeebled or hurt in their Conformation) whilst they are defended from the frequent Excursions of the infestous matter, may recover their former state and vigour. Which kind of Indication, though it be very seldom suddenly or wholly performed, yet sometimes the Cure is by degrees labour'd out, by diligence and care, however fixed and rooted the Morbid matter be.

The Nest or Tinder of the Disease, the blood, serum, nourishing juice, nervous Liquor, and the Recrements carried thorow the Blood.

As to what appertains to the first scope of healing, which is first and especially to be regarded; we said, that the Matter or Humours, which are wont to be gathered together about the parts of the Head predisposed to the Headach, and to excite the fits of the Disease, are either the Blood or the Serum, or the nourishing or nervous Juice, or Liquor. Moreover, with every one of these Vapours and Effluvia's, as also Recrements, sometimes Bilous, sometimes Melancholic, sometimes Acid, Salt, Sulphureous, and of some others of a various kind, taken into the Blood, from the Viscera, sometimes from those, and sometimes from these, we have shewed to be transferred by its passages into the Head: against the force and incursion of all these, Medicinal fortifications are to be instituted.

How the inordinations of the Blood may be taken away and prevented.

1. And in the first place, if the leading cause to pains, or a disposition thereto, lye about the Membranes of the Head, for that the Blood being hot, and apt to rise up, rushes by heaps into the Membranes of the Head, and when it cannot easily pass thorow them, distending the Vessels above measure, and pulling the nervous Fibres, excites the fits of this Disease (whose signs are a Sanguine temperament, heat, and a flushing or redness about the head and face; also an high pulse, and shaking, with veins distended with Blood) presently it must be endeavour'd, both that the Blood be made more sedate, that it may not be so readily moved into rage or swelling up; as also that it be not incited, and boiling up may not be carried with a greater tendency or inclination into the Head, than into other parts, nor in like manner be compelled to stagnate, by reason of the bosomes of the *Meninges* being too full. Wherefore, if the fit infests long, let blood in the Arm, or the Jugular Vein: out of the fit, sometimes it is expedient to take Blood from the Sedal Veins, with Leeches; to wit, by this means, that the Blood by chance boiling up, may be brought down towards that place, to which it often tends of its own accord. Let there be Medicines of Vinegar, Roscakes, and Nutmeg, or some other *Epithems* or Medicines of the same nature applied to the Head: Also give to drink *Tuleps*, *Emulsions*, or *Decoctions*, which allay the fervour or madness of the Blood. Let the Belly be cooled and kept soluble by the use of Clysters.

Clysters. Moreover, for prevention, use at times Whey, or Spaw-waters; also drinking of Water, a thin and a cooling diet help; the shunning of Wine, spiced Meats, Baths, Venus, violent motions of the mind or body, yea and of all hot things is to be ordered. Then for the fixing of the Blood, its Effervescencies or growing hot must be prevented, for which, Distilled Waters, Juices of Herbs, or Decoctions, Electuaries, Powders, and especially *Crystal Mineral*, are in frequent use. There is no heed here to add a method or particular forms of Medicines, when in this case, almost every body labouring, is wont to be his own Physician, being taught by frequent experience, from things hurting or helping.

2. It is rarely, that the Blood alone or only by it self is in the fault; more often other humors, being carried by its passage to the Head, and there disposed, cause the hurt: Therefore, when ever the Serous Colluvies, or heap, goes out from the Blood (as was shown but now) it causes Headaches frequently, (the signs of which are *Catarrhs* about other parts, viz. the Nose, Mouth, or Throat, being infested with them) then abstinency and rest is to be ordered, and that the belly be emptied by a Clyster, for the allaying the flux of the Serum, and that the matter be suffered to evaporate from the Membranes of the Head; if these do not succeed, and that the Headach ceases not quickly, and of its own accord, oftentimes in a more hot Constitution, Phlebotomy is convenient; to wit, because the Vessels being emptied of Blood, sup up the extravasated Serum: But in frigid tempers, Vescatories or Blisters are of notable use, applied to the hinder-part of the Head, or nigh the Ears. Then after the Belly is emptied by a Clyster, the Flux may be allayed, by the use of *Anodynes*, or more gentle opiats: that being allayed it may be convenient to exhibit a gentle Purge, then Medicines, which either move by Urine or Sweat, or by both together; that so they may gently evacuate the superfluous Serosities.

The pain of the Head from the serous heap, how to be cured.

Phlebotomy.

Purges.

Medicines fit for this purpose may be every where found in Books: which notwithstanding are not to be made use of by *Empericks* rashly, and without distinction; but ought to be designed according to the judgment and skill of a prudent Physician, always having a respect to the Constitution, the temperament, and proper disposition of the Patient, and to other accidents and circumstances, and to be compounded or altered according as the matter requires; yea sometimes to be prescribed extempore. Wherefore, since it will be altogether needless, here to heap up many Receipts, and a great pile of Medicines, it shall be sufficient to propose in this place, one or two forms only, of every sort of Medicines, respecting the chief intentions.

Take Pills of Amber half a dram, Resine of Jalap four grains, of Peruvian Balsam what will suffice to make four Pills, let three be taken when the Patient goes to sleep, and the other in the morning, if they work not enough.

Or Take of sulphurated Scammony half a scruple, of the Ceruse of Antimony fifteen grains, of the Cream of Tartar eight grains; make a Powder, to be taken in a spoonful of Grewel, early in the morning.

Take of the Sulphur of Antimony four grains, of the Resine of Jalap five grains, of the Cream of Tartar six grains, bruise them together, and with what will suffice of the Conserve of Violets, make a Bolus, to be taken early in the morning with care, or by government.

An emetick Powder.

Take of the Roots of Butchers-Broom, Burdocks, Cherefoil, Avens, each one ounce; of preserved Eryngo an ounce and an half, of the Florentine Iris three drams, of the lesser Galangal a dram and an half, of the Seeds of Burdock three drams, of the dried leaves of Betony, Sage, Vervine, female Betony, each half an handful; of Raisins of the Sun stoned two ounces; boil these in four pints of fair water, till a third part be consumed, then add to it of white Wine half a pound, strain it, and sweeten it (if need be) with syrup of the Five Roots two ounces; take of this six ounces warm, twice or thrice in a day, a good while after meals.

An Apozem.

For such as are indued with a more Cold and Phlegmatick Constitution, the like Decoction of the Wood of Guaicum, Sassafras, Sarsaparilla, with the addition of the afore said Ingredients, make an Apozem, of which take six or eight Ounces, twice or thrice in a day warm.

A decoction of Woods.

For the poor, and oftentimes with good success for the rich, I was wont to prescribe a Decoction of the dry'd leaves sometimes of Sage or Betony, Vervine, or Rosemary, made of Spring-water, and impregnated with the tincture of the Powder of the Berries of Coffee, taken warm twice a day, about six or eight Ounces.

A Cephalick Decoction impregnated with the Tincture of Coffee.

3. If that with the running out Serum, Saline, Acid, Bilous, or otherways Infestious particles, received either wholly from the Mass of Blood, or by its means from

The Headach from other humours mixt with the serum, how to be cured.

the Viscera, are carried into the Membranes of the Head, and being there fixed, bring forth great, acute, and continual pains, then it will be convenient to iterate sparingly, the taking away of Blood, yea and sometime a gentle Purge, to apply cooling Medicines, *Anodynes*, and sweetners to the distemper'd places; so oftentimes also to exhibite more gentle *Hypnoticks*, or Medicines causing sleep, at every turn; also *Apo-tems*, and the Juices of Herbs pressed forth, which allay the fervour of Choler, carry it forth gently by Stool or Urine, and are of known use: but in the mean time more sharp Medicines, or the more strong, whether they be purgative, working by Sweat or Urine, helping it, for that they too much fuse and shake the Blood and Humors, are carefully to be shunned. I have frequently observed in those labouring with an acute and pertinacious pain in the Head, the Serum swimming in the Blood being let forth, to be dyed with a yellowness, or Bilous Recrements being boiled in it; also in this case, let Phlebotomy be sparingly but often celebrated, and the drinking Whey, or Spaw-waters plentifully, have helped before any thing else.

The Headach arising from any Inward, how to be cured.

4. Further, by the fault of any Inward, as the Stomach, Liver, Spleen, or Womb, or of any other (by reason of the transmission of an evil Ferment) the parts of the Head suffer, then in the Cure of the Disease, Remedies for the Spleen are to be given, with *Cephalicks*, or such as are proper to the Head: Hence the Stomach being also in the fault, these often times are helpful to such as are troubled with Headaches, *Elixir Proprietatis*, the *Elixir of Vitriol of Mynsich*, the sacred Tincture, *Vitriol of Steel*, the Powder of *Aron Compound*, and others ordinarily had for the Stomach; for others whose heads partake of the evils of the Spleen, *Chalybeates*, or Medicines made of Steel often yield help. Some Women troubled with Headaches have felt ease from *Hysterical Remedies*. In like manner, when the vices of other parts contribute to the Headach, let there be joyned with the former shown you, things to be taken for those parts.

Rais'd up from the fault of the nourishing Juice, how to be handled.

5. Sometimes the nourishing Juice (as we showed already) is the cause of the periodical Headach, viz. so much as this being poured on the Blood, and not rightly assimilated, by reason of disagreeing particles, causes a swelling up in it, so that the Blood boiling up into the Head, carries its leavings or superfluities into the *Meninges*, or into some of their predisposed parts, and by this means stir up the Fibres into painful Convulsions. I have known many for this cause, to have been obnoxious to daily Headaches, whose Mass of Blood hath been vitiated after the Small Pox, Measles, and other Feavours, and sicknesses: viz. so many hours after eating, sometimes sooner and sometimes later, first a flushing of redness in the Face, then a fullness in the Head, and a pain would infest them, and especially after drinking of Wine, or eating of Meats apt to swell up, they would be more vexed: The coming of the Disease is wont to keep its distance, according as Meats are taken more or less, as the Chyme begins to swell up, either a little after its first entring into the Blood, or after a little stay in it.

Frequently follows the Small Pox and Measles.

Easily cured.

This Distemper is free from danger, and for the most part is easily enough Cured. After a provision of the whole, a gentle Purge, and sometimes Blood-letting being ordered, Remedies profit most which restore the Complexion of the Blood, such chiefly are *Antiscorbuticks* and *Chalybeates*.

An Electuary.

Take of the Conserve of Fumitory, of Tansie, and Wood-Sorrel, each two ounces; of the Powder of Aron Compound three drams, of Ivory, Crabs-Eyes, Coral prepared, each one dram; Powder of yellow Saunders, and Lignum Aloes, each half a dram; of the Vitriol of Steel one dram, of the Salt of Wormwood a dram and a half, of the Syrup of the Five Roots what will suffice to make an Electuary. Take of it in the morning, and at five a clock in the afternoon the quantity of a Chesnut, drinking after it three ounces of the following liquor.

A Julap.

Take of the water of the leaves of Aron, of Vervine, of Elderflowers, each six ounces; of the Water of Snails, and the Magisterial of Earth-worms, each two ounces; of Sugar one ounce: Mingle them.

Antiscorbutick Remedies good for it.

10. Hither may be brought various Remedies, that are wont to be made use of against the Scorbutick Dyscrasie, or evil disposition of the Blood, and may be given with good success: For Headaches, which are so familiar in the Scurvy, oftentimes proceed from the vice of the Blood perverting the nutritious Humor, and carrying its Recrements to the Membranes of the Head: Wherefore Remedies against that Distemper, in another place noted by me, may be used here.

The Headach raised up from the vice of the

6. There yet remains another humor, to wit, the nervous Liquor, which being heaped up within the Fibres of the Meninges, and of other parts of the Head, sometimes

times becomes impropportionate, by its proper incongruity, to the Fibres, because sharp or otherways degenerate, sometimes pulls the containing parts, and provokes them into painful Convulsions, or Distentions, because it grows hot with some other Humor flowing thither, to wit, the Nutritious or the Serous.

nervous humour, how to be cured.

The Nervous Humor, when it is so Morbific or faulty in its whole Mass, carries its evil to the predisposed Head, or if of it self innocent, is perverted within the distemper'd Fibres, and so secondarily becomes Morbific or Diseased; then the Cure of it depends upon the restitution of the containing parts; to wit, if the Debilities, or the hurt Conformation of the Fibres may be mended, presently the Humor watering them will be free from fault. We shall tell you by and by, by what Remedies the vices of the parts predisposed to Headaches may be taken away.

Its fault either private or particular,

In the mean time, if the nervous humor, being degenerate in the whole Mass, imparts its evil to the Head prepared for pain, those kind of Medicines, and method are to be made use of, by which it being reduced to its due Constitution, passing thorow those Fibres, it little or nothing provokes them. For which end, neither letting of Blood, nor yet strong Purges are at all convenient, because those things which shake the Blood and Humors, and lessen strength, impress by that means a greater sharpness and rage to the faulty Nerve. But gentle Solutives, and a sparing taking of Blood, sometimes may be useful, whereby the Inwards may be cleansed, and the bloody Mass somewhat purged, and a way made for other Medicines, that may better succeed.

Or universal; and then letting of blood, or stronger Purges, are not convenient.

But Medicines, which render the nervous Liquor more friendly and benigne to the Membranes of the Head, that are wont to be troubled by it, are of that sort commonly called *Cephalicks*, whose particles being active, thin, and subtil, pass thorow the Blood without trouble or tumult; then insinuating themselves with the nervous Liquor, gently move it, and so cause the nervous passages to be unfolded, so that the Animal Spirits, more freely beam forth thorow all the Bodies, both sensible and motive, and inspire them without any lessening, Convulsions, or irregular distentions.

Remedies called Cephalicks proper here.

Of which sort are these,

These kind of Remedies, although they are not always effectual, yet they oftentimes take away some Headaches not much inveterate, and in some, help sometimes how pertinacious soever they be. Further, the same which are prescribed with good success for the pains of the Head, are also for the distempers of the Brain and Nervous Stock; and so on the contrary, what are used for these, also for those; to wit, the virtues of those being unfolded within the Head, against the Apoplexy, Palsie, Lethargy, and other Diseases a-kin to them, help also within the moving Fibres, against Convulsions and Convulsive Motions; besides, putting forth their virtues within the sensible Fibres, they often give help to pains.

which are convenient in Distempers of the Brain, and in these kind of Headaches.

A very large field of these Medicines are opened in physical Books, yet so, that the poorness of them, and their abundance, bring confusion to the Method of healing; for oftentimes among so many various and different Remedies, heaped up together, lye hid or obscured, what may be of great use, but even as Wheat among Chaff, harder to be separated than that to be thorowly sifted out from the husks.

A great many of these every where to be found in Physical Books.

Therefore in this case, a provision of the whole being made, and applyed, and things given which by Dyet or Medicine, restrain the Inordinations of the Blood, and immediately allay them; Medicines called *Cephalicks*, or such as take away the disorders of the nervous Juice, are prescribed to be carefully taken. I shall add some few forms of these.

Take of the Conserve of the Flowers of Betony, of Clove-gilliflowers, each three ounces; of the Powder of the Root of the male Pæony half an ounce; of Cretick Dittanny one dram; of the wood Aloes, and yellow Sanders, each one dram; of red Coral prepared, of Pearl, of Ivory, each one dram and a half; of the Salt of Vervine one dram and a half; of the Syrup of the Flowers of Pæony, what will suffice: make an Opiat, take of it to the quantity of a Chestnut, drinking after it of the following Julep three ounces.

Take of simple black Cherry water, and of Walnuts, and of Vervine, each four ounces; of Cowslip Flowers three ounces, of Pæony Compound two ounces, of Sugar-Candy six drams.

Take of the Flowers of Vervine, Mistle Berries, each ten handfuls; of the male Pæony Roots two pound, of Mace and Nutmegs, each half an ounce; of Coriander tw. Seeds one ounce; cut and bruise them and put to them eight pints of new-milk (or else seven pints of Milk and one pint of Malago) Distil them in a common Still, and mix all the liquor together: Take of it three ounces at a time.

A distilled wa-

Take

Tablets.

Take of the Powder of the Root of the male Pæony half an ounce, of red Coral prepared two drams, of Ivory and Pearls prepared, each one dram; make of them all a very fine Powder, add to it of Sugar what will suffice; boil them to the consistence of Tablets with six ounces of black Cherry-water, of the Tincture of Coral one dram; make of them Tablets according to Art, to the weight of half a dram: Eat three or four in the Morning, and at five of the Clock in the Afternoon, drinking after them a draught of Tea.

Tinctures.

Or Take of the Tincture of Coral one ounce; take of it from fifteen to twenty drops twice in a day, in a little draught of Julep, or of the distilled water.

Spirits.

They who are of a Phlegmatick or more Cold temper may take a Dose twice a day, either of the Tincture of Antimony, or of the Spirits of Armoniac, impregnated with Amber or Coral, or of Spirits of Harts-horn, or of Sut, in a proper Vehicle.

The use of millepedes notably helps.

The other part of the conjunct Cause, consisting in the weakness or evil conformation of the distempered

part, how to be handled.

We are not to despair of the Cure.

We ought not to omit, or postpone the use of Millepedes or Woodlice, for that the Juice of them, wrung forth, with the distilled Water, also a Powder of them prepared, oftentimes bring notable help, for the Curing of old and pertinacious Headaches. I might here propose divers other kinds of Medicines; yea all those which I have formerly heaped up, against Convulsive Distempers, may be brought hither. But yet the most difficult knot of the Cure of the Headach, remains to be untied, to wit, how the conjunct Cause of this Disease, and fixed, consisting in the weakness, or hurt Conformation of the Fibres, may be healed or taken away.

Although this is sometimes incurable, to wit, when as a *Scirrhus*, or *Callous Tumor*, or some other old and fixed swelling, has posselt the *Meninges*; yet, for that the knowledge of this is uncertain, and that the leading Cause, how cruel soever it seems, is sometimes overcome by a long course of Physick; therefore in every Headach, so long as the Patient will admit of Remedies, let it not seem troublesome to the Physician, to prescribe those things which seem most convenient.

Here those Medicines are only profitable, that cut off the kindling or root of the Disease.

Chyrurgical Remedies chiefly help here; of which are,
1. Plasters.

Therefore, first of all, which we hinted before, you must carefully endeavour that the nest, or feeding of the Disease be cut off or intercepted, and that the frequent coming of the fits be hindred; for so the indisposed Fibres, so long as they are no more affected only by the means of Nature, will recover health.

In this case the helps of the Medical Art, are rather to be sought from the Chyrurgical part, than from Physick: for whatsoever is taken at the mouth, going about by long turnings and windings, spends all the vertue before it comes to the Membranes of the Head.

Among Chyrurgical Remedies, first Topicks are met with, and among these, Plasters are of most profitable use, and oftentimes give the greatest benefit: Let not these be very hot, which may rather draw the humors to the distemper'd place, but moderately discussing and strengthening. I was wont to prescribe Plasters of Red-Lead, and of Sops, with double of the proportion of the Plaster of *Paracelsus*, to be applied to the part, it being first shaven, and to be let remain there for some time. The Ancients frequently administred Plasters made of Mustard, and such as raised wheals or wheelks over the parts, and it is a daily practice to apply sometimes to all the hinder part of the Head, and sometimes to the former, Vesicatories or blistering Plasters, against most cruel Headaches: when ease is got from these more hot Topicks, it is because by these administrations, plenty of the more sharp Serum is drawn away from the disaffected part.

Medicines raising wheals and blisters.

Liniments, Fomentations and Bathings, help not.

Liniments of Oyls and Oyntments, though often made use of, effect little; because (as I think) if they should penetrate deeply into the tones of the Fibres, they would loosen them more; so that they would more easily lye open to the IncurSIONS of the Morbifick matter: Further, they stop up the Pores of the skin, whereby the Effluvia's do less evaporate. Almost for the same reason, as hot stipes or Fomentations made of boiled Spices, or other Cephalicks, oftner hurt than profit; forasmuch as they draw the humors towards the distemper'd parts, and also open the Pores and passages, whereby they are more readily admitted; it is that a Bathing of the Head, or an Embrocation or washing of the Head, at the pumps in hot Baths, is used with no better success for Headaches: When on the contrary, it hath been beneficial to many, to pour cold water every Morning and Evening on the temples, forehead, and forepart of the Head: yea to wash or pump the whole Head, every Morning with cold water, or at least to dip it into a Bucket or Pit of water.

An Embrocation, or a dipping of the head in cold water, oftentimes helps.

Issues.

Another Chyrurgical help, especially for an inveterate and cruel Headach, and much cry'd up, is wont to be the burning or cutting of Issues, in several parts of the Body. It is without doubt, that these being made in the Arms or Legs, are both less troublesome, and do bring something of help: because they draw away the feeding of the Disease

Disease in part, and call it away far from the distemper'd part. Besides, Issues in the nape of the Neck, and a Seaton in the hinder part of the Neck, behind the Ear, or near it; also a piece of the root of wild Hellebore, being put into an hole made in the Ear, because they evacuate much serosity, and draw it to other Emunctuaries, to wit, the Glandulas, are oftentimes administred with benefit. But indeed, there hath been a talk, and much expectation from Cauteries, made on the grieved place, or near it, and so large Issues have been made on the top of the Head, or nigh to the joyning of the Sutures. If we should measure this practice by the fruit or success, it will appear to be rarely beneficial, but more often unlucky. For I never knew any healed; but many troubled with Headaches, to be much the worse for it. And truly, reason plainly tells us, that where a Fontinel is made, thither the Serous Humor flows, from the whole bloody Mass, and by consequence from the whole body, and oftentimes is there heaped up more copiously than can constantly be put forth by that Emisfary: wherefore, there ordinarily arise about Issues, a red swelling, pustles, and various humors. Why should I not then believe, that a Caution made nigh to the grieved part of the Head, should rather cause the Morbific-matter to be there heaped up?

Issues made upon or near the distempered place, help little.

There is yet another Chirurgical operation cry'd up by many for a pertinacious Headach, but by none (that I know of) yet attempted, to wit, an opening of the Skull, near the grieved place, with a *Trypaning* Iron. This our most ingenious *Harvey* endeavoured to persuade a Noble Lady, labouring with a most grievous and inveterate Headach, promising a Cure from thence; but neither she, nor any other would admit that administration. Indeed, it did not appear to me, that there could be any thing of certainty expected from the opening of the Skull where it was pained, if an Imposthum lay hid there, this had been the only way of Cure; but that would rather have caused sleepy distempers, or deadly Convulsions than the Headach. If that a red swelling, or pustles, or a burning boil, should be in the enfoldings of the Head, I know not if those Tumors, exposed to the open Air, would more easily evaporate, or whether Remedies applyed to those naked places, would effect any thing or not; because, if the pains arise by reason of the *Meninges* being beset with little wheelks, a Scirrhus or a Callous Tumor, I think the opening of the Skull will profit little or nothing.

The opening of the Skull cry'd up by many, but rarely or never attempted.

But letting this alone till it is practised, we shall pass over to other things; and now in the next place, we shall consider, whether Salivation for the Curing old and confirmed Headaches is to be administred. Indeed, if the pains of the Head arise from the Venereal Disease, no doubt but that evil Remedy ought to be applyed to that evil Distemper: But having tryed that kind of remedy in Headaches arising from other Causes, I found not the harvest worth the pains, and I confess some examples in those kind of cases, have terrified me from that method. A certain noble Lady (whose sickness is below described) for the Curing of a cruel and continual Headach, underwent a plentiful Salivation three times, viz. the first by a Mercurial Oyntment, by the counsel of Sir *Theodore Mayerne*, and afterwards twice by taking the lately famous Powder of *Charles Huis*, without any help, I wish not with some detriment: for afterwards for many years, even to this day, the disease being by degrees increased, she suffer'd under its heavy tyranny. It happened somewhat worse, so that noted man Doctor *G. D.* to whom a Mercurial Oyntment was applyed for his akeing Head, for the Cure of an old Headach, by which a Salivation being excited, and the Disease not Cured, he fell into blindness. Indeed these kind of effects from Quicksilver, rashly given, every one, rightly weighing its operation on an humane body, ought to fear. For the Mercury, I shall not say is malignant or wholly venomous, because it brings little or no hurt, its particles being united, so that oftentimes a great quantity may be taken safely enough; yet the Mercurial little bodies, being divided and separated one from another, (whether it be done by Chymical Salts, as in the Mercury sublimate, and precipitate, or by straining thorow the Pores of the Skin when they are anointed) immediately become fierce and untameable, and stir up, before any other Medicines, great perturbations in the humane body: They sometimes bring trouble, first to the nervous parts, whereby oftentimes happen, (by reason of the Fibres of the Ventricle, Intestines, and other Viscera's, being pulled or hauled) Torments, horrid Vomitings, sharp and frequently Bloody-stools, Heart-burnings, Swoonings, and other most terrible Distempers, a little after the Medicine is given. Yet sometimes the particles of the Mercury, when they are not presently dissolved, go forth without any great hurt to the Bowels, and before their strength be deduced into the bloody Mass. Therefore they easily enter into this, being highly active, and unfolding themselves on every side, and immediately infecting the whole, shake

Whether salivation in inveterate Headaches, without any suspicion of the Venereal Disease, ought to be administred.

The means and manner of salivation by Mercury, unfolded.

shake it, and frequently (when fully dissolved) stir it up into a great burning. Then the Blood, that it might put away from it self, the incongruous little bodies, Fermenting, delivers the same which way it can, and boils it with the humors, contained within its bosom, to wit, the Serum and the nourishing Juice, and so endeavours, with those imbued with that preternatural mixture, to put it off. But this succeeds not plentifully enough by Urine and Sweat, because the meltings of the Blood, by the particles of the Mercury boiled in it, like the ladder of a Wash-Ball, become more clammy and thick, so that they cannot pass thorow the fine strainers of the Reins and the Skin, but oftentimes breaking forth (unless hindered) into the *Celiac* Arteries, go forth, by exciting a *Diarrhoea* or *Dysentery*; but by that the intent of Salivation is hindered or frustrated: but more often, the Liquor imbued with the *Mercury*, remaining within the Blood, in a manner also infected, is carried about with it, hither and thither, impetuously thorow the Arteries and Veins, and is separated into various parts, and either breaks forth what way it can, or is forced upon the Bowels, Membranes, and other parts, oftentimes with great hurt. Also it is seen that some Mercurial particles do penetrate the Brain, and insinuating themselves into the nervous Juice, are diffused, not only into the whole Head, but into all the nervous parts, and so in some measure ferment the nervous Liquor.

But in the mean time the Mercurial Serosities, residing in the Blood, are laid up for the greatest part into the Glandula's, which are the nearest Emunctuaries of the Arteries: wherefore, when the Glandula's about the parts of the Mouth (by which great plenty of Serum is destined for spittle) being both many and great, are there placed, and that from these passages lye open, by the Excretory Vessels, into the cavity of the Mouth; surely by this most certain way, the invenom'd liquor of the Blood, finds a passage forth, when it cannot easily elsewhere. Wherefore, a spitting at the Mouth being excited, the Blood long Fermenting, casts forth whatsoever is extraneous, and not agreeable, either that lyes in its bosom, or that it licks up elsewhere from the Bowels, or receives from the solid parts, or from other humors, like working Ale or Wine; thorow the Salival passages, and innumerable pipes opening every where into the Mouth. Further, it is most likely, as the purgings of the Blood, so also of the liquor watering the Head, and the nervous Appendix, being excited by the Mercury entering therein, are also put forth by this way, to wit, by the Salival passages.

Therefore, a Salivation induced by Mercury, if by chance it succeeds rightly, it sometimes takes away difficult and untameable Diseases, not to be dealt with by any other Remedies; because this operation thorowly purges the Blood and nervous Juice, and other humors, by a long purgation, destroys all exotick Ferments, overcomes the enormities of the Salts and Sulphures; yea, and shakes, and oftentimes carries forth the Morbific matter, where-ever remaining or impacted.

Salivation not
always safe,
wherefore to be
suspected in
Headaches.

But this Medicine is not without danger, so far as much as the Mercury becoming enormous, and carrying with it abundance of most sharp, and as it were poisonous Serum, rushing on the noble parts, and especially the Head, with the Medullary and nervous appendixes, or on the Lungs, and parts about the Heart, brings to them an incurable and sometimes a deadly evil. Wherefore in a more grievous and old Headach, there is danger lest the indisposed Fibres should be more irritated, by the Mercury going thorow them, with much, and corrosive Serum, and should move them into more painful Convulsions and wrinklins; further, lest it should invade the Brain, by a great falling of the Humors upon the Head, by which means, as it often happens to the Brain, sleepy and Convulsive distempers are caused. I should have said many things more concerning this, but that we expect shortly to be made publick, by the Learned Physician Doctor *Needham*, an exact method of Salivation, and a full account of it, as to its measures and effects, and its benefits and hurt.

What the cutting
of the Artery
may profit in
this Disease.

There is yet a celebrated Remedy remaining among Chirurgical helps, viz. a cutting or opening an Artery. This was of great esteem among the Ancients, and some of the Moderns make use of it, and very much cry it up. But it appears to our observation, that this so cry'd up success most often fails. Nor no wonder, because reason holds not at all, on which the Ancients depended, that the Arterious Blood was different from the Venous, or that of the Veins, and was in greater fault and more raging, and therefore to be let forth. Nor indeed is there any reason wherefore the Blood being drawn from the Artery, rather than from the Vein, near the pained place, should bring ease; but rather on the contrary, more help ought to be expected from opening of the Vein; because, the Artery being emptied, receives and draws nothing from the distemper'd part; but the Vein being opened, draws from the

the place of the effused Blood, and from its whole neighbourhood, and oftentimes sups back, and renders to a Circulation the Blood, and other Humors, heaped up and stagnating near the nest of the Disease. But however, that we may not recede too much from the practice of the Ancients, we shall grant, that sometimes it may be helpful, though attributing nothing to the section of the Artery, and not immediately, yet causally, and only by consequence and by accident: to wit, forasmuch as the ends of the Artery being cut, grow fast together, so that the passage of the Blood by that way is shut up for the future; from hence when as a lesser provision of Blood is carried by the Artery towards the place: and the like still carried away from it by the Veins, it therefore sometimes happens, that the nest of the Morbific Matter sometimes lessened, and its mine is by degrees consumed. For this reason, this administration oftentimes succeeds happily in diseases of the Eyes. Further, Farriers make use of the like practice for the Curing of evil tumors in the Legs of Horses; to wit, they take and bind the Artery, by which the Matter flows to the distemper'd part, and in the mean time, that which was impacted, partly evaporates, and is partly supped up by the Vein. And I have heard, that the same has been try'd by our Harvey, and not without success, for the Curing also of *Strumous* and *Scirrhus* Tumors in the humane body. I might here subjoyn many other kinds of Remedies, yea also the prescriptions and forms of Medicines, which are wont to be administer'd for the Curing of Headaches, both by *Physicians* and by *Empericks*: but enough of these are to be had in Physical Books. It will be to our purpose, that after the delivering the *Atiology*, or the reason of this Disease so confusedly shown, and its *Therapeutic* or Curatory part sufficiently shadowed, for the more clear illustrating of these things, that we add some more rare cases of sick persons, and examples of a continual and most grievous Headach, which also for an invincible cause was oftentimes deadly.

Nevertheless in this Distemper it is often helpful, and by what means, is shewn.

Farriers use the like practice.

And perhaps it may be convenient for the curing of strumous or running humours, such as the Kings Evil.

A Woman of about fifty years of age, after she had labour'd for about six months with a most grievous pain in the Head, troubling her almost perpetually, under the *Sagittal Suture* (or the seam, that goes thorow the length of the Skull, dividing it into two parts) yielding to no Medicines, or method, at length fell into a *Lethargy*, with a partial resolution of her members; from which notwithstanding, being shortly recovered by timely Remedies, she awaked with the Headach, as cruel as before; moreover, within two or three weeks after, relapsing into the sleepy distemper, she departed this life. Her skull being opened, there grew from the side of the third bosom, to the Membranes, a *Scirrhus* Tumor three fingers broad, by the coming between of which, both the *Dura mater* for a little space was grown to the *Pia mater*, and the sanguiferous Vessels, which should open there into the cavity of the bosom, were stopped up. Further, the cranklings or turnings in of the Brain, both the exterior and the inward cavity, was filled with a clear water. From these things being observed, the invincible and at length deadly cause most clearly appeared: to wit, the most sensible Fibres of the *Meninges* being continually pulled and torn, partly by reason of the breaking of the unity, and partly from the humor belonging to the Nerves, being there heaped up and stagnating, together with others flowing thither, and growing hot with it, were provoked into Convulsions perpetually, or painful Distentions. Afterwards, when the Blood being for a long time hindered in its circulation, by reason of that Tumor, or that at least it could not pass thorow it, by any means, sent copiously away from it self the Serous Water (as its manner is wherever it finds an hindrance) and at length a *Dropsie* in the Brain was raised, which was the cause of the deadly *Lethargy*. I remember I have seen the like case in another, whom I have opened. Further, as I think, the disease in many troubled with Headaches, doth depend on the like invincible cause; I will however describe one example yet living, of this kind of Distemper.

The History of a continual and a deadly Headach.

A continual and inveterate Headach passing into a Lethargy.

Some years since, I was sent for to visit a most noble Lady, for above twenty years sick with almost a continual Headach, at first intermitting: She was of a most beautiful form, and a great wit, so that she was skilled in the Liberal Arts, and in all sorts of Literature; beyond the condition of her sex; and as if it were thought too much by Nature, for her to enjoy so great endowments, without some detriment, she was extreemly punished with this Disease. Growing well of a Feavour before she was twelve years old, she became obnoxious to pains in the Head, which were wont to arise, sometimes of their own accord, and more often upon every light occasion. This sickness being limited to no one place of the Head, troubled her sometimes on one side, sometimes on the other, and often thorow the whole compass of the Head. During the fit (which rarely ended under a day and a nights space, and often held for two, three, or four days) she was impatient of light, speaking, noise, or of any motion, sitting upright in her Bed, the Chamber made dark, she would talk to no body, nor

A second History of an incurable Headach, in a most noble Lady labouring with it for twenty years.

take any sleep, or sustenance. At length about the declination of the fit, she was wont to lye down with an heavy and disturbed sleep, from which awaking, she found herself better, and so by degrees grew well, and continued indifferently well till the time of the intermission. Formerly, the fits came not but occasionally, and seldom under twenty days or a month, but afterwards they came more often: and lately, she was seldom free. Moreover, upon sundry occasions, or evident causes (such as the change of the Air, or the year, the great Aspects of the Sun and Moon, violent passions, and errors in diet) she was more cruelly tormented with them. But although this Distemper most grievously afflicting this noble Lady, above twenty years (when I saw her) having pitched its tents near the confines of the Brain, had so long besieged its regal tower, yet it had not taken it: for the sick Lady, being free from a Vertigo, swimming in the Head, Convulsive Distempers, and any Soporiferous symptom, found the chief faculties of her soul sound enough.

Remedies of every kind for the curing this Headach, try'd in vain.

For the obtaining a Cure, or rather for a tryal, very many Remedies were administered, thorow the whole progress of the Disease, by the most skilful Physicians, both of our own Nation, and the prescriptions of others beyond Seas, without any success or ease; also great Remedies of every kind and form she tryed, but still in vain. Some years before, she had endured from an oyntment of Quicksilver, a long and troublesome Salivation, so that she ran the hazard of her life. Afterwards twice a Cure was attempted (though in vain) by a Flux at the Mouth, from a Mercurial Powder, which the noted Emperick *Charles Hues* ordinarily gave: with the like success with the rest she tryed the Baths, and the Spaw-waters, almost of every kind and nature: she admitted of frequent Blood-letting, and also once the opening of an Artery; she had also made about her several Issues, sometimes in the hinder part of her Head, and sometimes in the forepart, and in other parts. She also took the Air of several Countries besides her own native Air, she went into *Ireland* and into *France*: There was no kind of Medicines both *Cephalicks*, *Antiscorbuticks*, *Hysterical*, all famous *Specificks*, which she took not, both from the Learned and the unlearned, from Quacks, and old Women; and yet notwithstanding she professed, that she had received from no Remedy, or method of Curing, any thing of Cure or Ease, but that the contumacious and rebellious Disease, refused to be tamed, being deaf to the charms of every Medicine. Further, this so long possessing the out-parts of the Head, though it could not invade the cloysters of the Brain; yet, when I visited her, unfolding its ends in some other parts of the nervous kind, it had begun to stir up most cruel pains in her members, and also in her Loins, and bottom of her Belly, as is wont to be in the *Rheumatism*, and in the *Scorbutick Colick*.

Conjectures concerning the reason of this cruel Disease.

If we should inquire into the *Aetiology* or the Causes of this inveterate Disease, we can suspect nothing less than that the *Meninges* of the Brain, being from the beginning more lightly touched, had afterwards contracted an habitual and indelible vice. It appears by the History, that the distemper at first arose from a Morbific matter, which was translated into the Head, after an ill cured Feavour. Then perchance, by reason of some hurt brought to the Membranes, the tone of the Fibres was so much endamaged, that afterwards, the Humors flowing in them, both the nervous and others, being heaped up to a fulness, or growing hot by mere aggravation, raised up the fits of the Headach. But at length the diseased cause growing worse, by reason of the frequent fits, it seems that the unity of those Fibres, were so much broken, that from thence little Tumors, or *Scirrhus* knots or swellings, being raised up in all the exterior *Meninge*, or in a great part of it, produced pains almost continual, and those apt to be made worse or imbitter'd upon every light occasion: Certainly it seems most likely, that the invincible and permanent cause of so long, and yet not deadly Headach, proceeds from some such thing, viz. a *Scirrhus* Distemper of the *Dura mater*, the *Pia mater* being in the mean time safe. For from any other cause, if there had been a conflict of Nature and Medicine with the Disease, either a quick death or a joyful victory had far sooner been obtained.

A third History of a deadly continual Headach.

A noted Gentleman of about forty years of Age, strong and healthy, going a journey for a whole day in a continual rain, the wet beating on the hinder part of his Head, caught cold, and the next day he began to feel a pain in that part; which in a short time after becoming very bitter, afflicted him night and day, and kept him almost continually without sleep. For the Cure of this Distemper, Phlebotomy, Purg- ing, Glisters, Blisterings, and Remedies to cause rest; yea and many others of every kind, though diligently applyed, by the Counsel also of many Physicians, helpt little or nothing. When the Disease notwithstanding these, grew every day worse, after a fortnights time, preternatural swell'd kernels and painful arose all about his Neck, the pain in his Head nothing remitting: Further, the Tendons of his Neck being

being very much distended and stiff, became very troublesome to him; to which, in a short time, succeeded Convulsive motions, and a sudden leaping of the Tendons, in several parts, with a delirium, and at length, the sick person worn out with pains and watching, yielded to death.

Though we had not leave for the dissecting the dead body, yet it may be suspected, that both the *Pericranium*, and the *Meninges* in the hinder part of the Head, cloathing the *Cerebel*, where they are more thick and very nappy, were first affected; and then from thence the evil was afterwards communicated to the whole Head, and wandered into all the nervous stock: when as in those Membranes, transpiration was hindered, from the cold and the wet, and also the tone of the Fibres very much hurt, it is probable, that the nervous Liquor watering them, being then hindered in its motion, and stagnating, did burthen the containing bodies; then that being depraved in its Complexion, grew hot with other humors flowing thither, and being at length coagulated with them, grew together into *Scirrhus* and *Strumous* Tumors, and so laid the copious seed-plot of a most grievous Headach: Then afterwards, when through watching and perpetual pains, a great inordination of the Spirits, and a great *Discrasie* of the Juice watering the Head, were produced; for that reason, the knotty Concretions in the Neck, the stiffness of the Tendons, and at length Convulsions and Convulsive Motions followed in the Brain, and in the whole nervous Stock: and so, when as the animal oeconomy or regiment was much decayed, and that the motion of the *Præcordia* could not be continued, the vital flame expired.

A conjecture concerning the reason of the Disease.

Sometimes deadly and incurable Headaches are no less raised up from a fiery swelling and Imposthum, than from these kind of knots, and little pimples of the *Meninges*. Sometime since, a young man of the University, whenas he had complained for a fortnight of a most grievous pain in the Head, incessantly afflicting him; it was at length increased by a Feavour, and afterwards, waking, Convulsive motions, and talking idly followed; at which time a Physician being sent for, letting blood, Clysters, Plasters, Revulsives, Blisters, also internal Remedies which call away the Flux of the Blood and Humors from the Head, being carefully administred, profited nothing; so that death soon followed. His Skull being opened, the Vessels leading to the *Meninges* were full of Blood, and very much distended, as if the whole Mass of Blood had flowed thither, so that the bosoms being dissected and opened, the Blood presently rushing forth, flow'd to the weight of several ounces above half a pint: Further, the Membranes themselves being distemper'd thorow the whole, with a fiery Tumor, appeared discoloured: These coverings being taken away, all the infoldings of the Brain, and of its Ventricle, were full of a clear water, and its substance being too much watred, was wet, and not firm. Without doubt in this case, the incursion of the heated blood into the *Meninges*, and the heaping of it up there, exciting the *Phlegmon* or fiery swelling, was the cause of the Headach, and of the following *Delirium*: Then the Blood being accumulated there, when it could not circulate, flung from it self plenty of *Serum*, by which the whole inward part of the Head was over-flowed; so that the Disease, at first perhaps curable by Phlebotomy, from thence afterwards became mortal.

A fourth History of an Headach, excited from a fiery Swelling, or an Inflammation of the Meninges.

I remember another *Academick*, who after a long Headach, under the temporal Suture, tormenting him perpetually for three weeks together, immediately fell into a deadly *Apoplexie*. His Head being opened, a fiery swelling had grown in the *Meninges*, near the place where the pain was, from which, being ripened and broke, the filthy bloody matter falling on the Brain, had distemper'd its substance with a rottenness and blackness. Besides, these invincible causes, detected by *Anatomy*, I observed more chances after the same manner, as of other sick people; by which we may conclude its *Ætiology*, to be the same, or very near of kin, with the signs and symptoms of the like nature, and but now described.

An History of an Headach raised up from an Imposthume in the Meninges.

But although a continual Headach (especially if it be without intermissions for many weeks) is not without danger: yet we ought not therefore to despair of its Cure, because the cause of this, how fixed and immoveable soever it seem, oftentimes by the long use of Medicines, and sometimes without them, is helped by Nature and time: however, in a case almost desperate, there is need of some Medicines, lest the present Distemper should pass into a worse, to wit, a Soporiferous or Convulsive. Thus much for a Continual Headach: it now remains, that we should propose some more rare examples and instances of the *Intermitting*

A continual Headach, not always to be accounted incurable.

Therefore, that we may let alone here, the Headaches, whose fits being wandering and uncertain, proceed from the Blood or Serum rushing on the distemper'd places, as cases very well known, and commonly seen; we shall now shew you now some select Observations of this Disease, either periodical, or caused by the consent of some

An intermitting Headach, whose Fits are uncertain, are so frequent that we need shew no Inward: instances of it.

Inward: As to the first, we have shown the periodical fits of the pains of the Head, to be produced by the nutritious Humor, or by the nervous Juice: we shall now shew you Examples of either.

The sixth History of a periodical intermitting Headach.

A venerable Matron of about forty five years of Age, of a lean habit of Body, and indued with a Cholerick Temper, after she had lived for a long time obnoxious to Headaches, wont to be caused occasionally, she began about the beginning of Autumn, to be troubled with a periodical pain of the Head: This Distemper invading her about four of the Clock in the Afternoon, was wont to continue till midnight, when being wearied with pain and watching, she was compelled to sleep; then afterwards awaking out of a profound sleep, she found her self well again. She being sick after this manner for three weeks, suffered the daily fits of this Disease, and forbore to take any Medicine, which she greatly abhorr'd; but at length her Appetite being lost, and her strength worn out, being forced to seek for Cure; after letting blood and a gentle Purge, she took twice a day for a week or two, the quantity of a Chestnut of the following *Electuary*, and grew perfectly well.

The Cure of the same.

Take of the *Conserve of the Flowers of Succory and Fumitory*, each three ounces; of the *Powder of the Root of Aron Compound* two drams and a half, of *Ivory* one dram and a half, of *yellow Sanders*, and of *Lignum Aloes*, each half a dram; of the *Salt of Wormwood* one dram and a half, of *Vitriol of Steel* one dram, of the *Syrup of the Five Roots* what will suffice to make an *Electuary*.

The reason of this Case unfolded.

In this Case, that after a disposition to the Headach, the fits of the Disease became at length periodical, after the manner of intermitting Feavours, the cause without doubt was, the assimilation of the Chyme, or nourishing Humor, into Blood, being hindered: because, when its provision being received into the Mass of Blood, could not be overcome, it was wont after a little stay to disagree, and with its particles, to grow hot; therefore presently the Blood swelling up, that it might shake off the incongruous mixture, laid aside its recrements, as in other parts, so especially and with a greater sense of trouble into the before weak Fibres of the *Meninges*, or hurt in their conformation: This Matter being poured on the Head, or rushing of it self thorow the sensible Fibres, or growing hot with the Juice watering them, raised up the fit of the pain but now described; which continued until the heterogeneous particles growing hot, with their mutual coming together, were either subdued or exhaled.

The seventh History of the same Distemper, excited by the default of the nervous Liquor.

A very comely Woman, tall and slender, being for a long time grievously obnoxious to distempers of the Head, was wont sometimes to be troubled for many days, yea weeks, every day as soon as she awaked in the Morning, with a most Cruel Headach, afflicting her for three or four hours: and in the mean time, she was vexed with a weight of her whole Head, a numbness of her senses, and a dulness of mind: which kind of Distemper, together with the pain, like discoloured Clouds, vanished before noon, and left her quiet and calm: Then again the next morning, it possessed her Head like a dark Cloud. For the Curing of it I prescribed the use of Purging Pills, Phlebotomy sparingly, besides a Blistering, and Spirits of Harts-horn, or of Sut, with *Cephalic Juleps* or Waters.

The Cure of it.

The reason of the case unfolded.

That in this Lady, otherways than in the other sick Lady, the pains of the Head rather followed after sleep, than were healed by it, the reason seems to be, because in this morning Headach, the Morbific Matter resided in the nervous Juice, whose more notable crudity, and fuller aggestion about the Head, happen immediately after sleep, as we have elsewhere shown at large: But the other Evening fits of this Disease, depended upon the fulness and swelling up of the nourishing Liquor within the bloody Mass, and therefore happening so many hours after dinner, was not allayed but by sleep, which quiets the disorders of the Blood.

An Instance of an intermitting Headach, which seem'd to be excited from the womb.

It doth no less clearly appear, that the fits of the Headach do arise, sometimes by consent from other parts, viz. the Womb, Spleen, Stomach, &c. and though the complaints; and the experience of the sick, declare it to arise from Vapors, yet from the Histories of them, and their appearances rightly weighed, 'tis most clear, that this proceeds from another reason, than from Vapors carried to the Head from the distempered inward. And in the first place, as to the pains of the Head, that seem to arise from the Womb, there is nothing more frequent than that upon the suppression of the Monthly Flowers, or the *Lochia* after being brought to bed, or (as they call it) the flooding, for cruel Headaches to succeed. Further, although the Terms do rightly flow; yet some at the instant of its flowing, others at the stopping of the same, are wont to be troubled with a cruel pain of the Head. But indeed, though

though at the same time, as the Head, the Womb also is distemper'd: however it doth not follow, that the evil is transferred from hence, thither immediately: but the Blood it self, which fixes the Morbific Matter to the Head, carries it, sometimes begotten in its proper bosom, and destined to the Womb, wrongfully into the *Meninges* of the Brain; and sometimes snatching it from the parts of the Womb, delivers it with greater malice to the Head. This same reason may also serve for the Headach, commonly attributed to the Stomach, Spleen, and other parts.

A beautiful and young Woman, indued with a slender habit of body, and an hot Blood, being obnoxious to an hereditary Headach, was wont to be afflicted with frequent and wandring fits of it, to wit, some upon every light occasion, and some of their own accord; that is, arising without any evident cause. On the day before the coming of the spontaneous fit of this Disease, growing very hungry in the Evening, she eat a most plentiful Supper, with an hungry, I may say greedy appetite; prefaging by this sign, that the pain of the Head would most certainly follow the next Morning; and the event never failed this Augury. For as soon as she awaked, being afflicted by a most sharp torment, thorow the whole forepart of her Head, she was troubled also with Vomiting, sometimes of an Acid, and as it were a Vitriolick, Humor, and sometimes of a Cholerick and highly bitterish: hence according to this sign, this Headach is thought to arise from the vice of the Stomach.

That I may render a reason of this, first it appears, that a Vomiting will succeed a hurt upon the Head, to wit, after a blow, or wound, or a fall; yet a pain of the Head rarely or never follows, upon Vomiting, the pain of the Heart, or the Stomach, any otherways labouring, unless the Blood comes between. Wherefore in the aforesaid case of the sick person, as it appears plainly that the *Meninges* of the Brain were before disposed to Headaches, its fits were stirred up by every agitation of the Blood; hence it is obvious to be conceived, when the heterogeneous particles are heaped up together to a fulness, in the bloody Mass, by reason of the vice of the Chyle, presently a flux of it arising, for the expulsion of the trouble, those being but evilly match'd, being separated by the Blood, and partly poured forth out of the Arteries into the Ventricle, do raise up its Ferment, and so produce hunger; and partly rushing into the predisposed *Meninges* of the Head do there dispose the tinder, or rather incentive of the Headach about to follow. This sick Gentlewoman, averse to all Physick, when she would undergo no method of Medicine, at length became obnoxious also to Paralytick, and Convulsive distempers. Out of these it will be easie to design the reason of every other Headach, viz. of the *Hypochondriac*, *Hepatic*, or otherways *Sympathetical*, so that there need not here to be added any more Histories or Observations.

The eighth History of an intermitting Headach, seeming to arise from the Stomach.

A reason of this Case delivered.

The like reason is for other Headaches, seeming to arise from the Spleen, Liver, Mesentery, &c.

C H A P. III.

Of the Lethargy.

THUS far we have described, by what Disease chiefly, and after what sort, the out-skirts of the Head, or the coverings of that enclosed within the Skull, are wont to be affected; and now descending to its more internal part, and which lyes next to the Cortical or shelly substance, we shall see to what distempers this part is found to be chiefly obnoxious. We have shew'd at large in another place, that the *Cortex* or shelly part of the Brain is the seat of the Memory, and the porch of sleep: wherefore, we rightly referr the Disease, which is wont to cause an excess of sleep, and an eclipse or defect of memory, to wit, the *Lethargy*, to that Cortical part of the Brain.

The word *Lethargy* is wont to signifie two sorts of Distempers, which are as it were the act and the disposition of this Disease; for those who are said to labour with this Disease, or are sick of its great assaults, are overwhelmed with so great sleepiness, that they can scarce be excited by any impression of a sensible object, yea if by chance being prick't or pinch't, they open their Eyes, or move their members, presently they let them fall again, and become insensible; and oftentimes when left to themselves indulging a perpetual sleep, by an easie transition, they pass into death it self, whose type this Disease is; which kind of fits, have often a Feavour joyned with them, which when the sick awake, and return perfectly to themselves, for the most part

The Seat of the Lethargy is the same with that of Sleep and Memory; to wit, about the Shell of the Brain.

By this name both the Fits of the Lethargy are called.

And also the soporiferous disposition, or Sleepiness;

Of which there are various kinds:

The continual Sleepiness, the Coma, &c.

In every Lethargick Distemper there is an excess of Sleep, and a defect of Memory.

The essence and causes of natural and non-natural Sleep, rehearsed.

The causes of preternatural Sleep are,

An infarction or obstruction of the outward part of the Brain, and a recess of the Spirits from thence:

Sometimes this, sometimes that, is the cause.

The Lethargy oftentimes from the serous heap overflowing the outward part of the Brain:

And sometimes from a Dropsie of the whole Brain.

part ceases of its own accord. Or secondly, they are accounted *Lethargical*, who being oppressed with an immoderate torpor or numbness of the senses, are found to be almost ever prone to sleep; so that in the midst of a journey, yea at dinner, or though busied about any thing, they presently fall into a drowsiness. But as there are diverse degrees, and various manners of this sleepy distemper, so also they constitute the various kinds of this *Lethargick* disposition. We shall for the present speak first of the former *Lethargy*, and properly so called, and afterwards of continual Sleepiness, also of the *Coma*, *Caro*, and other soporiferous Diseases akin to it, and likewise of Continual Waking.

In the mean time, it is to be noted, that almost in every kind of Lethargy, there is always as its *Pathognomick* sign, a Torpor or Sleepiness, and oblivion or forgetfulness. Those who suffer the more grievous fits of this Disease, if they are awakened by any force in their declination, forget all things, nor are they able to remember their own, nor the names of their Friends: also, those who have drunk more sparingly of this forgetful cup, as much as they are proclive to Sleep, so much are they deficient in Memory; so that they forget late actions, and oftentimes repeat things done, and very often ask the same questions: As to the other faculties, as Reason, Phantasie, the sensitive and loco-motive powers, the failings or defects of them, are proportionate according to the enormities of Sleep and Memory. Wherefore, that the formal reason, and the causes of the *Lethargy*, may be the better known, we should here first of all discourse concerning sleep and oblivion, and for what causes they are excited.

But having already discoursed concerning the former of these, we shewed that the essence of Sleep did consist in the corporeal souls withdrawing it self by little and little, and contracting the sphere of its irradiation, left destitute and as it were shut forth of doors, the outmost compass of the Brain, or its shelly part, and so the exterior, and all the organs of sense and motion, from the emanation of the spirits; so that they for refreshment sake, being called inward, lye down and give themselves to rest; in the mean time, the Pores and passages of the outward part of the Brain, being free and empty from the excursions of the spirits, are prepared for the coming of the nervous Liquor, stilled forth from the Blood, for a new provision of Spirits. In accustomed and natural Sleep, these two causes conspire and happen together, as it were out of a certain mutual compact of Nature; viz. at the same time, the Spirits give place, the nervous Humor enters: but in unnatural sleep, or that which is extraordinary, sometimes this cause, and sometimes that is the former; for the Spirits being wearied or called away, first withdraw themselves, and so offer an entrance to the nervous humor heaped up before the doors; or else the nervous humor driving to those places more plentifully, and as it were making its way by force, repels the Spirits, and entring into their passages, does as it were drown them: we have particularly assigned the various occasions of either of these, and after what manner they come to pass. Concerning the eclipse or defect of the Memory, we need not speak much here, because it is wholly from the same cause, as immoderate Sleep, to wit, the exclusion, and an interdiction for a time, of the passing up and down of the Animal Spirits, from the exterior passages of the Brain, full of some humor.

Preternatural Sleep, or an insatiable sleepiness (which is the chief *symptom* in the *Lethargy*, and sleepy Diseases) seems to arise wholly from the same causes as non-natural Sleep, carried forth only with greater force or energy; to wit, either the Animal Spirits, being first distemper'd, leave the outward compass of the Brain, and give an entrance, not only to the nervous, but to the serous, and some other vicious Humor; or else, the superfluous and excrementitious humors, together with the nervous, break thorow the cortical doors of the Brain, and as it were overflowing its Pores and passages, drive thence and repel the Spirits; sometimes this is chiefly the cause, sometimes the former, and sometimes both together. We shall first speak of that which is the more frequent cause of the *Lethargy*, to wit, the eruption of either too much, or too incongruous humor, upon the confines of the Brain, and then afterwards of the departure of the Spirits from the affected part.

I have often found by Anatomical observation, that the *Lethargy* doth arise from the Serous heap rushing into the outward infoldings of the Brain, and entering into its Pores and Cortical passages; for in many dead of this Disease, I found the spaces between the foldings of the Brain, full of clear water, yea and its outmost substance soft and infirm, from too much wet; moreover in some I found the interior cavities swelled with water, and the whole frame of the Brain overflowed with a Dropsie, or rather a flood. When therefore in a great and mortal *Lethargy*, it hath appeared that it has been after this manner, we may well suspect in a lesser and cureable sleepiness,

ness, that the out-borders of the Brain, are at least too much watered with humor, and the tracts of the Spirits overflowed; especially if there appear any signs of water or of Serum, abounding about other parts of the Head.

A grievous sleepiness is wont to be excited, not only from the Serum being too much, or from the over plenty of any other Morbific humor, but sometimes from its malignity: for it often happens, that a certain infestous and virulent matter is instilled from the Flood into the Brain, which entering the Pores of the Cortical substance, profligates the Spirits, and either extinguishing them, or driving them away inwards, so that this region being left destitute of them, a sleepiness and forgetfulness succeeds. There is none almost who hath not taken notice, that this often happens in malignant and ill handled Feavours: also in the *Scorbutick Cachexie*, the *Yellow Jaundice*, and certain other *Chronical Diseases*, oftentimes a sluggish and vapid or tasteless water is sent in, instead of the subtil and spirituous nervous Juice, that is the parent of forgetfulness, and of sleepiness.

Not only a plenty of humour, but the malignity, often causes this Disease.

This Conjoint Cause of the *Lethargy*, to wit, the heaping up of too much Humor, or too incongruous, within the shelly part of the Brain, depends upon other Causes, to wit, more remote leading causes, and also evident causes. As to the former, they are wont to be in fault, both when the Blood supplies the distemper'd part with Morbific matter, and also because that the Brain it self too easily admits it.

The procrastick causes of the Lethargy. In what respect they are in fault;

For indeed, the Blood transfers to the Head in some, a great quantity of a watery humor, and in others of a salt or scorbutical humor, also again in others excrementitious humors, and deadly to the animal government, sometimes taken from these bowels, and sometimes from those; and as occasion serves, instills them together with the nervous Juice, out of the Arteries on the outer borders of the Brain, and there by little and little insinuating this kind of Morbific Matter, by a long congestion, causes a dark cloud, or else by a sudden transportation of it, overflows at once all the outward part of the Brain, and drives away the inhabiting Spirits, like a Sea breaking in, and compels them to run more inwardly.

Both the Blood begetting evil humours, and sending them to the Brain;

But indeed the Morbific Matter, how copiously or infestous soever it be, and poured on the Head, doth not induce the *Lethargic* Distemper, unless the very weak or vicious constitution of the Brain be also in fault: for if this be strong and of good temper, it easily resists the assaults of all those; yea it bears, without hurt, the errors and enormities in the fix non-naturals. Those who have this part too humid, or too cold, as Children and old Men; also, those distempered with *Cachochymical* Humors, the *Dropsie*, *Scurvy*, or Humors gathered about the mouth of the Stomach, are very prone to sleep, and sometimes fall from a stronger Evident Cause, into a continual drowsiness. Besides, those who have a weak Brain, and their Pores too lax or open, that by that means the feculencies obtruded from the Blood find a more easie passage, often become obnoxious to sleepiness, yea and to the *Lethargy*: for such as are given to Surfeiting and Drunkenness, are wont presently after to fall asleep, which weakens the tone of the Brain, and fill, and too much open its Pores, with a crude and filthy Juice; so that when it hath been for a long time accustomed, by reason of these occasions, to admit into them the Serous superfluities, it afterwards refuses nothing brought to it, but that its passages, like a course or wide strainer, suffers all the grosser particles, both Saline, watery, and earthy, easily to pass thorow them.

and the Brain too easily receiving them.

Upon what occasions the Brain is prone to the Lethargy.

Besides these more remote leading causes (which become the act of the stirred up Morbific) there are more strong Evident Causes, for so great danger does not hang over the Brain, as that its whole compass should be invaded, from every morbid provision, nor upon every light occasion. But there are many and diverse occasions, by which the sleepy assaults are seen to be incited: the chief of these are great Surfeits, Drunkenness, especially of Wine, or the Drinking immoderately of Strong-waters, then after such excess to lye all night, or sleep in the open Air: further, an evacuation of the Serum, by other ways, after having been long suppressed; also if Spaw-waters being drunk in a larger quantity, and not again render'd presently by Urine, threaten a *Lethargy*. And so also do recrements of other Diseases, either not well or not at all Cured, being translated to the Head; so as a continual sleepiness often happens after acute Feavours, or such as continue long, and other *Chronical Diseases*, and especially the *Headach*, *Frensie*, *Empyema*, or collection of gross Humors upon the Lungs and the *Colick*.

The evident causes of this Disease.

Thus much of the *Lethargy*, whose assault proceeds from the *Cortex* or shelly part of the Brain, being affected; to which succeed either an eclipse or an exclusion of the Spirits there inhabiting, with a sleepiness and oblivion. But as non-natural sleep, so sometimes what is preternatural, begins from the Spirits being first dejected; and which is usual to succeed another Cause. It is obvious to any one, that this ordi-

Another con-junct cause of the Lethargy consists in the afflicting the Spirits with some narily narcotick.

How opiates
cause Sleep.

How they operate in the Ventricle, and by what means in the Brain.

The History of one presently kill'd by taking too large a Dose of Opium.

Sometimes a Lethargy arises from Narcotick Particles begotten in the Body;

Even as Convulsions from a nitro-sulphureous, or explosive matter.

ordinarily happens from more strong Opiates, without any previous flood or stopping of the cortical part of the Brain: for it is not probable that Narcoticks stir up the Humors, and send them to the Brain, when it plainly appears, that all the effervescences and flowings of these, are allayed by them. But if it should be asked after what manner, and by what means, Opiates cause sleep, and sometimes a deadly Torpor or sleepiness, we say; That this Medicine is a certain kind of poison, beating down or extinguishing the Animal Spirits, by its blasting; the Blood and solid parts in the mean time being almost untouch'd: Wherefore, when the Animal Spirits become raging, and as it were struck with madness, running hither and thither, and will not be quieted and allayed, Opiates being administer'd, like water flung upon a flame, destroy some of the outmost bands of them, so that the rest being lessened, and flying inwards, quietly lye down. We have at large discoursed of these things in a particular Tract, *Of the Operations of Medicines on the Humane Body*: For the present we shall note (which is to the purpose) that *Narcoticks* (or Medicines causing rest) being taken at the mouth, do put forth their powers partly in the Ventricle, and indeed immediately, and partly in the Brain, both that and the Mass of Blood mediating. By what means *Narcoticks* do operate, whilst in the Ventricle, and provoke sleep, we have shewn, *Chap. XV*. When they are moderate, in either province, they gently intoxicate some unquiet Spirits, and so immediately quiet the rest; but if any one takes Opiates in too large a Dose, he shall presently feel hurt both in the Ventricle and in the Brain, and a little after being insensible, shall suffer a greater evil in either; to wit, a mighty heaviness, and as it were an immoveable weight in the Stomach, which seems to oppress both it and the neighbouring parts; indeed by this sign, the Fibres of this place (the Spirits which before actuated them being broken) become without life, and as it were dead; then by reason of the Opiate, particles being carried about with the Blood, to the frame or compass of the Brain, and instilled into its Cortical or shelly part, the Spirits being driven away from thence or extinguished, an irresistible, and oftentimes a deadly sleep follows: yea, I have sometimes known, from a more grievous hurt inflicted on the Ventricle, only by the use of a more strong *Narcotic*, Death it self to have followed before sleep could creep upon them, coming by a long way about. A strong man vexed with a most cruel *Colick*, for ease sake (whilst a *Physician* was sent for) took rashly a great quantity of Opium; a little after he had taken it, he complained of a great burthen oppressing, and mightily weighing down the Ventricle: His Friends and the by-standers gave him Cordial waters, Wine, and Strong-waters, but without any ease: This oppression creeping wider about the Precordia, raised up pains and swoonings; but still being awake, and constant in mind, he cryed out, that his spirits more and more failed him; till about three hours after, complaining that his sight was gone, he presently dyed.

But that we may return to the *Lethargy*, as it is a Disease and not the effects of Opium, whence we digressed; concerning which we are yet to enquire, whether it may arise from a Narcotick Humor begotten in us, as some *Chymists* assert? We shall tell you our conjecture, that we think this 'tis sufficiently plain, that there are other sorts of Morbific particles produced in our Bodies, than those commonly called Elementary and Humoral, and that they do affect after a various manner, viz. besides the Watery, Earthly, Bilious, Phlegmatick, or Melancholic, we may find others *Vitriolick*, *Nitro-sulphureous*, and others participating of enormous Sulphurs and Salts, and active to our evil. The Convulsive *Pathology* can by no other means be delivered and explained, unless by supposing that some extraneous little bodies, and as it were *Nitro-sulphureous*, which sticking to the Spirits, and at last cast off by them, stir up the Explosive, that is Convulsive force: In like manner we may think, that others of another nature may perhaps be begotten, such as are of a *Sulphureous*, *Vitriolick*, or Narcotick nature, which when they creep into the Brain and nervous Stock, fall upon some Animal Spirits, which they by chance do meet, with extinguishing and fixing them, ordinarily induce their losses and eclipses, such as happen in the *Vertigo*, *Aplexy*, or *Palsie*, as we shall more fully shew hereafter. In like manner, in a great fit of the *Lethargy*, though it be improbable, that these kind of *Narcotick* particles should be in heaps derived from the Blood into the Brain, in so great a quantity, that they should at once overturn the spirits dwelling in its whole precincts, and fix them; yet we may believe, that this may be some part of the Cause. Wherefore, in every long sleepiness, or *Lethargick* disposition, we do suspect the Animal Spirits, to be burthened with such a *Lethaan Copula*, and that we should direct the darts of every Medicine against it.

Thus

Thus much concerning the formal reason, subject, and causes of the *Lethargy*, properly so called, the summ of all which is, That the Animal Spirits, the inhabitants of the exterior Brain, being hindred from their wonted motion and emanation, lye down in a profound and inextricable sleep: but they are hindred either by the proper vice of themselves, because having taken or being distemper'd by some Narcotick, they are as it were coagulated and become immoveable; or because their exterior tracts or paths in the Brain, are obstructed and possessed by some strange guest, so that there is no fit space granted them for their expansion.

The symptoms of this Disease, which now come in order to be explained, the chief are Sleep, and forgetfulness, or a cessation of every other knowing or spontaneous function, unequal and slow breathing, a Feavour, and oftentimes, the distemper growing worfe, Convulsions, a leaping of the Tendons, and at length universal and deadly Cramps or Convulsions.

As to the too former of these, we mentioned before, that Memory is deficient altogether for the same reason, as Sleep exceeds; to wit, forasmuch as the Spirits inhabiting the outward part of the Brain, being either bound up or expelled from their tracts, do not irradiate or beam forth from the Callous Body, into the Cortex or shelly part of the Brain, by which imagination or waking is made; nor do they, being carried inwards, and repeating their former footsteps, represent the Ideas or Images of things before acted. Indeed, Sleep, Watching, and Memory, are affections of the same parts and places: of which it is no light sign, and which vulgarly appears by experience, that *Opiate Medicines*, by which Sleep is provoked, being often given, hurt the Memory. Yea I my self knew one, having taken a strong *Hypnotick*, or Medicine to cause sleep, after being sick with a Feavour, lived many nights and days without sleep, and almost wholly lost his Memory, especially as to any thing long past.

As to what respects the other faculties of the Corporeal Soul, to wit, the Imagination, Appetite or desire, Sense, and Motion, although no *Narcotick* or sleepy chains are cast upon the Spirits destinated to these offices, and that the Pores and passages of the interior Brain, within which they are wont to expatiate, are seen to be open enough, yet these Spirits, because during the fit, they are denied their commerce with the others bound up, of themselves lye down, and are overcome by Sleep. For as a continual sleepiness beginning about the root of the sensitive Soul, to wit, the Cortex or shelly part of the Brain, immediately its whole province is obscured, as it were with a veil, to wit, the knowing, desiring, and self-moving part of the Soul, and also the intellect it self, its windows being every where shut up, hardly speculates, or beholds any thing.

Further, the power or force of this Disease, is seen to be extended to the other part of the sensitive Soul, presiding o're the Cerebel and its Regiment; wherefore, during the fit of the *Lethargy*, the respiration and Pulse are altered: for that becomes unequal and slow, sometimes drawing the breath deep and long, sometimes short, repeated, and as it were double: and this being great and swift, diffuseth a feavourish heat thorow the whole body.

The reason of the former, if I am not deceived, is this, to wit, that the same Morbific Cause, which infects the outward part of the Brain, and its inhabitants, infects also in part the *Cerebel*, and the Spirits there serving for the motions of the *Precordia*; which being by that means disturbed and hindred, though they omit not thir tasks, yet they perform them difficultly, and with interruption; hence the *Diaphragma* and Muscles of the *Thorax*, do not so easily and swiftly as before, perform their *Systoles*, but laboriously and with a longer straining or endeavour, and sometimes with repeated tryals or forces. This kind of unequal, long, and difficult breathing, frequently happens also in a *Phrensie*; wherefore, some judge the cause both of this and that, to be from the inflammation of the Midriff or *Diaphragma*, but amiss, because the symptom in both these *Cephalick* Diseases depends on the *Cerebel*, participating the hurt of the Brain, grievously distemper'd.

As to the Feavour of one troubled with a *Lethargy*, to be known by the great and quick Pulse, hot breathing, with a burning of the Tongue and Mouth, without any heat in the extream parts, some deduce this from the same cause as the *Lethargy*, to wit, either from Phlegm putrefying in the Brain, or from a cold inflammation of the Brain. Others on the contrary, affirm the Feavour to be the primary effect, and thence the Morbific Matter to be carried into the Head, from the burning Blood.

Concerning these, we grant, that a *Lethargy* comes often after a Feavour, but we can say nothing of the Phlegm putrefying in the Brain, or of its frigid inflammation, which is as much as to say, icy fire; for if this be malignant, or of evil custom, happening

What things belong to the Theory of the Lethargy.

Its symptoms.

The chief of which are, a sleepiness, and oblivion.

By what means the other faculties of the Soul, to wit, the knowing, desiring and locomotive, are affected.

The evil of the Disease reaches also to the Cerebel.

Hence breathing is often hurt, or altered.

This proceeds not from the inflammation of the Midriff.

From whence the Lethargick Feaver.

Not from Phlegm putrefying in the Brain.

Nor is the former always the cause of it in the Lethargy. Lib. de Morb. Convuls. Cap. vii; p. 96.

More often the effect of this Disease

proceeds from the Organical Circulation of the Blood, being hindered or altered.

How none dyes without a Feavour.

The Prognostick of the Lethargy.

When the Disease is desperate.

When it is only so.

When some hope may be conceived.

From whence more hope may be had.

Whence more of hope than of fear.

pening also to Children, old Men, and other Phlegmatick, Scorbutick, or very *Cachymical* persons, or such as are full of ill humors, about the height of a Disease, not well Cured, oftentimes in the place of a *Crisis*, the feavourish matter being snatch'd into the Head, induces a cruel and oftentimes a deadly Torpor or sleepiness; which notwithstanding ought not to be esteemed the symptom of the Disease, but of that Feavour. After this manner I have often observed, and elsewhere have particularly described, that Soporiferous Feavours, and as it were marked with a certain sleepiness, have raged and become *Epidemical*, at sometimes, by reason of the evil constitution of the year.

But it is no less usual when a *Lethargy* is the principal distemper, for a Feavour to follow, and to owe to it as much its original, as its Cure; for a Feavour beginning after a continual sleepiness, that being shaken off or discussed, ceases soon of it self; such a Feavour we think to arise, not from the Blood growing hot by reason of the strife of intestine particles, but because of the impulse of the containing and neighbouring bodies, variously altering and disturbing its course. For indeed the right temper of the Blood very much depends, not only on its particles being truly mixt and overcome, but also upon the motion impressed on the Heart and the Vessels, or the Organical Circulation; to wit, that its Liquor may every where flow with an equal and alike flowing and ebbing; which, if finding any where a stop or Remora, it be retarded, its motion is made more impetuous, and with a Feavourish tumult in the whole channel besides. This manifestly appears in violent passions, acute pains, a breaking of the unity, in all which the Blood being obstructed in one place, or straitened, it is snatched more vehemently in others, and conceives a Feavourish heat; for this cause, to wit, lest the thread of its circulation should be broken, on which life necessarily depends; wherefore as the Proverb says, *None dyes without a Feavour*: For how poor or deficient soever the Blood is, and that the strength of all the moving parts are weak, yet in the instant agony of Death, by the mere impulse of Nature, they either pursue their functions, or the nervous Fibres every where erect themselves, and put forth their utmost endeavours, that they might drive forward the Blood flowing in them, and Circulate it with a rapid motion. I once visited an illustrious Lady, who for some time had been miserably afflicted with *Colick* and *Convulsive* distempers, and quite worn out, and at length fell suddenly into a deadly *Lethargy*. When I perceived her Pulse to beat strongly, I prescribed that four ounces of Blood should be taken out of the jugular Vein, which immediately leap'd from the opened Vessel, with such force that, I believe, if it had been suffered, the whole Mass of Blood would have flowed thence: for the next day after, her dead body being opened, I found scarce four ounces more of Blood in her whole Body, and yet she dyed thus in a Feavour. The reason of the *Lethargick* Feavour is wholly the same, which is seen to arise only from the Vital Organs, being very much incited by labouring Nature, and therefore vehemently driving about the Blood.

The prognostick of the *Lethargy* is shut within a strait limit; for the fit of the Disease being for the most part acute, is soon terminated either in Death or health, and for the most part it is wont to give more of fear, than of hope. If it comes upon a malignant Feavour or hard to be cured, or if it comes upon other *Cephalick* or *Convulsive* Diseases, as the Headach, Phrensie, Madness, Epilepsie, or also upon a long and grievous *Colick*, or Gout, the *Physician* can predict nothing but evil: nor is it less to be feared if it happen in a Body full of evil Humors, or one long sick, or in an old Man.

In like manner it is an evil omen, if the sick, being presently overwhelmed with a great Torpor or stupidity, and almost *Apoplectick*, cannot be awakened, and if he breaths unequally, and slowly, or with a great snorting, then the Disease increasing, and the sick troubled with tremblings, Cramps, leapings of the Tendons, and at length with *Convulsive* Motions, it is to be esteemed desperate or without hope.

But if the Distemper be excited, without any great foregoing Cause, with an only Evident Cause, as a Surfeit, Drunkenness, or by the use of Narcoticks, a blow on the Head, or some not deadly stroke, we may expect the event to be less deadly or mortal.

Then if the Distemper, arising from such occasions, happens to a Body before whole and strong; if it does not wholly take away the Sense and Memory at the first assault, and after a short time the symptoms begin to remit a little, of such a sick person you ought not to despair.

In every *Lethargy*, if any Cause of the Disease is seen to be cut off and removed, so that if by the help of Medicines, or the instinct of Nature, copious and helpful evacuations by Sweat, Urine, or by Stool do follow, with ease or help, or if by applying

plying of Blistering Plasters a great deal of water flows forth, if a swelling or great wheals or pustles break out behind the Ears, or in the Neck, if frequent sneezing happens, or water flow from the Eyes or Nose, thence a certain hope of health may be expected.

Hippocrates l. Coac. c. 145. mentions a Cure of the Lethargy, to be often made by the distemper of the Thorax; saying, *That many Lethargicks that are stuffed with Phlegm have recovered.* Which words are wonderfully wrested by Interpreters. Mercurialis understands by suppuration, the putrified matter of the Disease, to be evacuated by the Ears and Nostrils. Prosper Martianus will have Hippocrates to be understood in the word Lethargy, not the disease of the Head, but of the Breast. But wherefore are all these subtleties? when it often happens that the Morbific matter, at first fixed in the Head, and stirring up a continual sleepiness, or Lethargy; the same being thence supped up by the Blood, and deposited in the breast, doth produce an Empyema, or a spitting like those whose Lungs are wasted. In the description of a Soporiferous Epidemical Feavour, which raged in the year 1661. we noted the same to have happened to many.

A red Swelling coming upon a Lethargy sometimes cures it.

Concerning the Cure of this Disease, for that it has no respite or truces, it is not to be deliberated on: after a sharp Clyster being given, let a Vein be opened presently, for the Vessels being emptied of Blood, they are more apt to sup up the Serum, or other Humors deposited in the Brain. Further, in this case, I advise rather to open the Vein in the Neck, than that in the Arm. Because by this means, the Blood being very much heaped up, within the bosoms of the Head, and perhaps standing still, is more easily reduced to an equal Circulation.

The Cure of the Lethargy.

Phlebotomy almost always necessary.

Letting blood being performed, immediately other remedies of every kind are to be made use of: Let Velicatories or blistering Plasters be applied largely to the Neck and Legs; anoint the Temples and Face with Oyl of Amber, or Cephalick Balsoms; lay over all the Feet a Cataplasim or Poultis, made of Rue, Crowfoot, and Pepperwort, with black Sope and Bay-salt; use hard frictions or rubbings to the Members, frequently apply to the Nostrils Salt of Urine, or Spirits of Sal Armoniac.

Outward Administrations.

Then let there be administred Cephalick Remedies.

Internal Remedies.

Take of the Water of Pæony Flowers, of black Cherries, Rue, and of Walnuts, simple, each Julap. three ounces; of the Water of Pæony Compound two ounces, of Castor tyed up in a rag and hung in the glass two drams, of Sugar three drams; mix them and make a Julap, let it be given about four or five sponfuls every three or four hours; also with Spirits every Dose of this, give twelve or fifteen drops of the Spirits of Amber, or of Sal Armoniac, or a paper of the following Powder.

Take of the Powder of the Root of Pæony the male, of a Mans Skull, of the Root of Virginian Serpentworth or Snakeweed, of Contrayerva, each one dram; Bezoar, and of Pearl, each half a dram; of Coral prepared one dram, make a Powder, and divide it into twelve parts.

A Powder.

Further, here it is to be considered, whether an evacuation, either by Vomit or Stool, should not be made. I know that this is variouly controverted among Authors, and I have also known it performed with various success: which being weighed and laid together, I shall briefly propose my opinion.

A Vomit or Purge.

If the Lethargy should arise upon a Surfeit, or a late Drinking, or if from taking some disagreeable things, or Narcoticks; presently let a Vomit be given; wherefore, you may give Salt of Virriol, with Wine and Oxytel of Squills; or in strong bodies an Infusion of Crocus Metallorum, or of Mercurius Vita, with black Cherry water. Let it be given, and if it doth not work of it self, provoke Vomiting with a Feather thrust down the Throat.

How they are indicated.

But if the fit of the Disease comes upon a Feavour, or any other Cephalick Distempers, or if it be raised up primarily, or of it self, by reason of some foregoing cause before lying in the Blood or Brain, then a Vomit or Purge being given at the beginning, when the matter is flowing, doth oftentimes more hurt than good; because the Humors whilst in motion, are more shaken and agitated, and when they cannot be subdued and brought away, they drive them into the distempered part.

When to be avoided.

On the second day, if the numness doth not remit, let Phlebotomy be repeated, if the Pulse shew it fitting; or else instead thereof, take forth blood from the Shoulders, after Scarification by Cupping Glasses; then a little after (if nothing hinders) let a Vomit or Purge be administred.

Scarification.

Catharticks.

Take of the Sulphur of Antimony five grains, of Scammony sulphurated eight grains, of the Cream of Tartar six grains; mingle them, make a Powder; let it be given in a spoonful of the afore prescribed Julep.

Or Take of Scammony sulphurated twelve grains, of the Cream of Tartar fifteen grains, of Castor three grains; make a Powder, and let it be given after the same manner. In the mean time, let altering Medicines, or such as derive the matter from the place, the same or such like, be still continued.

Errhines, Sneezing Powders, and Apophlegmatisms, &c.

On the third day, and afterwards ought to be applied such things, which are forbid at the beginning of the Disease, for fear of a new Fluxion, viz. Errhines, or things that Purge the Head at the Nose, Sneezing Medicines or Powders, Apophlegmatisms, or Medicines which draw the Humors from the head by the mouth. Further, it is then sometimes expedient to apply the warm intrails of some animal new killed, to the forepart of the Head, after the hair is clipped or shaven off, and often changed: also sometimes to foment those places with a Discussing and Cephalick Decoction, or Emmentation: but before all other Topicks, I have known great help brought from a large Vesicatory or Blistering, with many running sores made all over the compass of the Head. I saw two sick with the Lethargy, after the Disease held long, and that not only the Memory, but almost all knowledge was lost, Cured chiefly by this Remedy: for in both of them, the fleyed places, when they could not be easily covered, poured forth great plenty of thin matter, about half a pint every day. It will not be needful to set down any more Medicines of this nature, being commonly and every where to be had; it now remains, that we illustrate what we have said, with some Histories of sick people, which I shall here add.

A Blistering applied to the Forepart of the Head very much helps.

The first History.

A Country-man about thirty years old, of a Phlegmatick Complexion, something inclining to Sanguine, being a long time obnoxious to frequent Headaches, about the beginning of Winter, became sleepy and very stupid; and one day, whilst he was following the Plow in the Fields, lying down on the ground, he fell into a profound sleep, and when he could not be awakened by his servant and others calling him, he was carried home and put to bed; his Friends in the mean time expecting that after he had finished his sleep, he would awake of himself. After the space of twelve hours being past, when he could not be awakened by pulling, thumping, noise, and other means, they sent for me; as soon as I came, I applied Blistering Plasters, large ones, all about the hinder part of the Neck, then taking from him about sixteen ounces of Blood, I caused him to take a strong Clyster, and his Face and Temples to be anointed with Oyl of Amber, and Frictions and painful Ligatures to be applied to his Legs. Also I prescribed him to take oftentimes in a day, Spirit of Sur, with a Cephalick Julep. Notwithstanding he lay all that day stupid, without any sense; and if being provoked by some strong or hard pulling, he lifted up himself a little, and opened his Eyes, presently falling down again, and shutting them, he fell into his continual sleep again. About Evening I took care to have Cupping Glasses, with a great flame to be applied to his shoulders, which done, he began a little to awake; and about that time he had a great stool, and very much Serum flowed forth from the Blisters, the Plasters being taken off, then we had great hopes of his health. And therefore at every turn, remedies being applied that night; awaking in the morning following he knew his Friends, and answered aptly to those who interrogated him: But as yet the whole cloud was not vanished, but that being sleepy, he remained several days oblivious, till at length, being purged twice, he perfectly grew well.

The reason of this.

This case has the exact type of the Lethargy, properly so called, where for the conjunct Cause, it had an heaping up of abundance of Serum about the compass of the Brain, and then a breaking in of it into its infoldings: and when by a timely use of Remedies, the flowing in of new matter was hindered, and that which lay upon the part was partly supped up into the Blood, and partly being rarified into Vapours and Effluvia's, was shaken off, the Cure of the Disease quickly and wholly followed.

A second History.

An Oxford Gardiner being sick of a Feavour, about the height of the Disease, instead of a Crisis, he fell into a continual Sleep, and lay drowned in it for three or four days, so that he could not be awakened by the use of any Remedies: But at length, his Head being shaven, Blistering Plasters were applied all over his Head, and many running sores left open, and awakening he recovered the use of his senses a little: But his Memory being almost wholly lost, he became so stupid, that he remembered the name of no Man, nor their words, and remained like a Bruit. When he had thus remained foolish for the space of almost two months, and still very sleepy, the cloud

cloud began a little to be dispelled : and at length, he returning to his wonted labour, was in indifferent good health ; but he never had afterwards the same vigor of mind and wit, as he had before this Disease. In this case you have an example of a *Lethargy* coming upon an ill Cured Feavour, in which the Morbific Matter, by a sudden translation of it into the outward part of the Brain, had for a little while filled, not only all the Pores and passages, but also had so hurt their Conformation, that the Spirits being for some time excluded, and at length freed, they could not recover their former paths, or wonted tracts, till of a long time after.

I remember very well, the example of a *Lethargy*, arising from the use of *Opiates*, in a Country Village where I lodged by chance one night, by reason of the foulness of the weather. For being about to go to bed, mine Host asked me if I would visit two poor people his Neighbours, distemper'd after a wonderful and miserable manner. When I shewed myself ready to do the office, not only out of Charity, but led also by curiosity, I was carried willingly into a small and poor Cottage, where I found the Father an old Man, and his Son, both of them in two Beds in one and the same Chamber, overwhelmed with a most profound Sleep, which had oppressed them the day before, after they had eaten some roots, which they had dug up in the Garden, being it seems Henbane, which they took for Parsnips.

The third History.

After they had both Oyl and *Oxymel* poured down their throats, and a Feather thrust down a great way, that made them vomit, I prescribed for them tincture of *Castor*, with a spoonful of *Treacle-water* (which Remedies I had then about me) to be given them at every turn all night : besides, that they should anoint their Nostrils and Temples with the same Tincture ; and if it might be done, that a strong Clyster should be given them : the following day the old Man first, and afterwards the Son awaking, returned to themselves, the sleepiness being almost wholly shaken off. In these distemper'd, after the reliques of the *Narcotick* were cast out by Vomit, lest they should do further hurt, there was only need, that by fit Medicines (among which *Castor* deservedly is esteemed to be contrary to the venom of *Opiates*) the Spirits being excited, should be set free from the sleepy poison afflicting them.

The Cure described.

CHAP. IV.

Of some other sleepy Distempers, viz. a continual *Somnolency*, the *Coma*, or heavy Sleeping ; and the *Caros*, or a deprivation of the Senses.

IN the former Chapter, we have fully shewn what doth belong to the knowledge, prognostick, and Cure of the *Lethargy*, properly so called. But we did not only therefore affirm, that the seat of this Disease was in the unequal compass, the cranklings, or infoldings of the outward part of the Brain, because we had there assigned the repository of the Memory, and the porch of Sleep, (although we might from hence conclude it,) but besides, because it hath appeared so to me from *Anatomical* observations very often, that the *Lethargy* does not arise (as is commonly thought) from the interior Ventricles of the Brain being distemper'd : for we have known, these to be frequently overflown with water, and sometimes distended with extravasated Blood, and yet the sick whilst they lived, were free from the *Coma*, or any great stupidity. I must confess, that sometimes the Dropsie of the whole Brain causes the continual sleepiness : but in this case not only the internal Cavity, but also the *Interstitia*, or the spaces between the outward Infoldings, are filled with a flood of waters.

Sleepy Distempers do not arise by reason of the Ventricles of the Brain being filled with water.

The *Lethargy* therefore being confined to the outmost borders of the Brain, we so constitute its limits, that those circlings about, being almost wholly possessed, together with the interspersed Marrow, perpetual and inexplicable Sleep, or hard to be rid of, with oblivion or forgetfulness, is induced ; in the mean time, the middle part of the Brain, or the *Callous* body, from whence the Animal Spirits irradiate, or beam forth, into all parts both sensible and motional, being almost unhurt ; for the total eclipse of this causes the *Apoplexy*, as shall be shewed hereafter. But indeed on either sides of these ends or limits, other soporiferous distempers are ordinarily found, which though of kin to the *Lethargy*, yet some of them are lesser than it, as *Somnolency* or continual sleeping, and the *Coma* ; only one is greater, as the *Caros*. There-

The ends or limits of the *Lethargy*, as to the places distempred, are constituted.

Some sleepy Distempers lesser than that, viz. Sleepiness, and the *Coma* : The *Caros* is greater than it.

fore we shall now, and in order, speak briefly of every one of these, as also of some opposite passions, viz. thorow waking, and the waking *Coma*: and first of Continual Sleepiness.

Continual Sleepiness described.

Most Authors call this not a Disease, but an evil habit, or a sleepy disposition, for the distemper'd, as to other things, are well enough; they eat and drink well, go abroad, take care well enough of their domestick affairs, yet whilst talking, or walking, or eating, yea their mouths being full of meat, they shall nod, and unless roused up by others, fall fast asleep: and thus they sleep continually almost, not only some days or months, but (as it is said of *Epemenides*) many years; wherefore we ought to believe this a Disease, and worthy of Cure, which defrauds one of more than half his life.

Its Seat assigned.

The seat of sleepiness, as that of the *Lethargy*, is to be placed in the outward part of the Brain; but with this difference; that the material or conjunct Cause of this Distemper, though it vexes, or troubles always without doors, yet it penetrates less deeply than the *Lethargy*; yea it disturbs or affects almost the whole superficies of the Brain, or the mere *Cortical* substances of the infoldings, the included marrow being almost untouch'd: in which respect, it differs not only from the *Lethargy*, but the *Coma* also; for in the Distempers which we described, though continual sleep presses on them, yet 'tis easily broken off; then besides, being fully awakened they remember many things, and converse with their Friends, though immediately prone again to sleep; whence it appears, that the cause of this Disease sticks only in the outer border of the Brain, nor does it enter deep into its compass, as other sleepy distempers do.

In what respect it differs both from the *Lethargy* and the *Coma*.

The conjunct cause of Sleepiness.

But indeed it may be suspected, that while the Blood every where washing the border of the Brain, with thick rivulets, and insills every where into it a subtil water, for the matter of Spirits, oftentimes a great plenty of water flowing thither with it, and entering together the *Cortex*, and remaining there, mightily fills it, and (like an *Anasarca* in the Body) swells it up: But this *Cortical* or shelly part being swelled up after this manner, and as it were dropical, so presses the *Medullary* infoldings, every where lying under it, that the expansion of the Spirits being hindred, by reason of the Pores of the exterior part of the Brain being something bound up, sleepiness is induced; to which it happens, that the Blood, that by reason of the *Cortex* of the Brain being intumescied with water, as it were between the Skin, Circulates less expeditiously, thorow all the neighbouring parts, and so is apt to fill the Vessels and bosoms, and to stagnate in them; by which means it comes to pass, that the exterior border is yet more compressed, and so the spaces requisite for the emanation of the Spirits, are also more freightned. Indeed this appears to be part of the cause, from hence, because this kind of sleepiness, by reason of the Blood not freely circulating in the Head, and therefore apt to stagnate, is wont to make red the Face, with a certain blueness and blackness: Further, whilst the subtil Liquor, which is for the matter of Spirits, passing thorow this pond or deluge heaped together in the *Cortex* of the Brain, goes forward into the Marrow lying under, it is probable, that with it do creep thorow some extraneous, and as it were very small *Narcotick* particles, which growing to the Spirits immediately render them torpid or stupid, and prone to sloth of their own accord.

What the deluge or *Anasarca* of the *Cortical* part of the Brain is.

To which happen an heaping up, or as it were a stagnation of the Blood, about the compass of the Brain.

Also a Torpor or Sleepiness of the Spirits.

This Distemper, as I have observed in many, is not very dangerous, for as it often happens, it is wholly Cured, or at least remaining for many years, without the *Carus* or *Apoplexy* (which is wont to be feared) it doth not become mortal or terrible. The Cure of this Disease often happens, the seat of it being changed, to wit, when clearing the Brain, the Morbific Matter is transferred to the *Cerebel*, which coming thither, produces tremblings of the Heart, the *Asthma*, loss of Spirits, and other troublesome Symptoms, commonly taken for *Hypochondriacal*.

The Cure of Somnolency.

The Curatory Method suggests chiefly these intentions, to wit, that after a provision or foresight of the whole, that (where it is convenient) Phlebotomy be performed, and a Purge given; then those Remedies to be diligently administered, by which the Blood and the Brain may be freed from the watery deluge, and this latter may be strengthened, whereby it may for the future receive and retain the Serous superfluities. For those ends, once or twice a week, may be given Pills of Amber, or of *Cochia*, with the Resine of *Falap*; at other times, let there be taken daily Morning and Evening, a Dose of a *Cephalick Electuary*, or Spirits of Tincture of *Sal Armoniack*, Amber, Sut, with a *Cephalick Julep*: the forms of which may be picked out of those above described. At eight of the Clock in the Morning, and at five in the Afternoon, let them drink a draught of *Coffee*, or the Liquor prepared of that Berry, first boiling in it, the leaves of *Sage* or *Rosemary*, till it has got a greenish

greenish Tincture. Let them drink for their ordinary drink, a Decoction of *Lignum Sanctum*, adding towards the end, the leaves of *Sage* or *Betony*, or other *Cephalicks*. Further, it is expedient that two large Issues be made between the Shoulders, and also frequent Blistering Plasters be applied about the Neck. The hair being cut off, let a quilted thing of *Cephalicks* and Spices be worn under the Cap. Let them also hold their nose often over a Vessel fill'd with Salt of Urine, or the Spirit of *Sal Armoniack*; let care be taken that they keep to an exact order of diet, and that those attending the sick, do not only rouse them from sleep, but daily at some set hours keep them waking.

A certain Gentleman of a Sanguine Complexion, and when he was young, of a sharp and cunning wit, but afterwards growing aged, being given to idleness and drunkenness, became dull and stupid, and also Dropical, with a great paunch, and his thighs and legs swelled. Yet from these Diseases (which he frequently fell into) when he abstained at any time from drinking, and took Physick, he oftentimes quickly grew well. But at length, though he was freed from the Dropsie, he was oppressed with so heavy a sleepiness, and that almost perpetually, that in what place soever he was, or what ever he was doing he would sleep; then being awakened by his Servants or Friends, his mind appeared well enough, and for a few minutes he would discourse of any thing well enough, then immediately fall again to sleep. To this man I prescribed, after he had taken in vain several Medicines, that every Morning and Evening he should take of the Powder of the Leaves of *Betony* dried in the Sun, and kept in a Glass, a spoonful in a draught of the distilled water of Lavender Flowers. By which Remedy finding ease, after a few days, he was perfectly Cured within a month, and enjoyed perfect health for four years after: Afterwards by reason of his evil manner of living, the same returned again, but the same Remedy found not the same success; yea there was need of other Medicines besides; sometimes he took the Spirits of *Harts-horn*, or of *Sut*, with an appropriate Julep; sometimes *Cephalick* Conserves and Powders, to which sometimes Steel was added. When he would indulge himself by Drinking, instead of Wine or Beer, he drunk Coffee; but for his ordinary drink, he had sometimes Ale, with the leaves of *Scurvigrass*, *Sage*, and Spices infused in it; and sometimes with Woods, Spices, and *Cephalick* Herbs boiled with it: He lived thus for many years after, almost always intemperate, and full of gross humors, yet free from the *Lethargy*; at length a *Cachexy* or evil state of Body invading him, and wasting with a Cough and *Asthma*, by degrees, he dyed.

An History.

The Cure of the Sick described.

The next sleepey Distemper before spoken of, greater than this last, and yet lesser than the *Lethargy*, is that which is commonly called the sleepey Coma. Those troubled with this, are for the most part oppressed with an heavy sleep, which they almost still indulge, and lye with their mouth gaping, and their lower Jaw fallen down, more like dead than living persons; being rouzed up by some strong pulling or pinching, they look about, speak to those standing by, answer their questions, but immediately sleeping again; they are much troubled to be hinderd or disturbed from sleep so pleasingly creeping on them. And thus indisposed after this manner, they continue for many days, yea sometimes months, sleeping without any Feavour accompanying, or following it, nor have their breathing hurt, and not very forgetful, in which it differs from the *Lethargy*: Again, they differ from those sick of the Distemper but now described no less; because, those sick of this Coma, are for the most part fixed to their Bed or Chair, and walk not abroad as the others, nor take any care of their household affairs. They answer to any short questions properly, but they cannot discourse, or deliberate about doing any business.

The sleepey Coma.

Without doubt, the Cause of this is of the same nature as the former, but of a middle degree between those two but now described; for indeed, it may be well suspected in this Distemper, that the Morbific Matter doth penetrate the Brain a little larger than in a Continual Sleepiness: to wit, the turning cranklings, or Cortical infoldings, together with the small Rivulets of the included Marrow are invaded: But yet they reach not to the greater bosoms of the Marrow, within the Callous Body, that are wont to be possessed in the *Lethargy*.

The reason of it.

The Coma sometimes beginning first and of it self, like the *Lethargy*, proceeds either from a Serous deluge poured forth from the Blood into the Cortex of the Brain; or else from a *Narcosis*, or a sleepey stupidity inflicted on the spirits dwelling there; and then, by how much this Distemper is lesser than the *Lethargy*, by so much it is esteemed less dangerous. But this Disease more frequently comes upon other Chronical or acute Diseases, to wit, the Headach, Convulsions, and frequently ill-judged Feavours, especially in Children, old Men and Women, and Phlegmatick people. Some time since, I observed in the Epidemical Feavour of the Nerves, (which have else-

The Coma is either a primary Disease, or it comes after other Distempers.

where

where described) as some were *Lethargical*, so many were troubled with this Sleepy *Coma*; of whom many grew well, the Morbific matter being translated from the Head into the Breast. Further, in other cases, this Distemper of a doubtful event, between hope and fear, requires the careful pains of a prudent Physician.

The Cure of it when it is a Disease of it self.

In the primary *Coma*, the Curatory Method suggests almost the same intentions of healing as in the *Lethargy*: as to the Morbific Matter, indeavour must be had, both that a new flowing into the Brain may be prevented; and also that what is already impacted, may be dissolved or taken away. Further, the Animal Spirits ought to be roused up, or excited, and all sleepiness or stupidity shaken from them. For this end, ought to be applied Purging, Blood-letting, Cupping-glasses, Blistering Plasters, repelling and dissolving Topicks, and *Cephalick* Medicines to be given, and chiefly such as are impregnated with a Volatile Salt, and many other means of administration already recited.

The Cure of the Coma as it is the symptom of another Disease.

But if this Disease coming upon other Distempers, happens to a person, whose Body is already much worn out, the Blood vitiated, or greatly depauperated, you must seriously deliberate before taking away of Blood, or Purging: yea, also abstain very much from them. Yet sometimes that the Conjunct Cause, or matter of the Disease impacted in the Brain, may be put into motion, it may be expedient, to take away Blood moderately, either from the Forehead or Temples, by Leeches, or from between the Shoulders by Cupping-glasses and Scarification. Here Blistering Plasters are in chief esteem, to be applied not only to the hinder part of the Neck, or Head, but to the Legs and Arms, and other parts of the body, by turns. Further, let there be given frequently the Spirits of Harts-horn, of Sut, of *Sal Armoniack*, Amber, or a Mans Scull, Coral, and others, impregnated with other *Cephalicks*, with a *Julep*, or any other proper Liquor. The forms or Receipts of these, and of other Remedies, used in these cases, together with the Histories of the sick, and examples of Cures, are extant in the description of the aforesaid soporiferous Feavor; so that there is no need to inculcate here again, the same, or such like.

In Lib. Of Convulsive Diseases Chap. viij.

3. Of the Caros.

There yet remains an other sleepy Distemper, or kind of *Lethargy* or continual sleeping, commonly called *Carus*, which is greater than the *Lethargy*, and somewhat lesser than the *Apoplexy*, and is so near akin to this, that it often passes into it; but yet it is wont to be differenced from either: For those sick with the *Carus*, breath well for the most part, and when they are strongly pulled, they move their Members, sometimes lift themselves up, open their Eyes, and often speak, which *Apoplethical* persons do not; yet the same, though excited or moved, do scarcely understand any thing, or plainly discern, in which respect they are distinguished from such as have the *Lethargy*.

How it differs from the Lethargy and the Apoplexy.

The Seat of the Caros is a little deeper in the Brain than that of the Lethargy.

From these it appears, that the Conjunct Cause of the *Carus*, doth penetrate deeper towards the middle part of the Brain, and hath its seat in the outmost border at least of the *Callous* Body; wherefore the Animal Spirits, being restrained from their wonted expansion, within this *Emporium*, the acts of the Imagination and Memory cease, and although the Species being impressed from a more strong sensible, is directed inwards, and oftentimes the local motion is retorted to it, yet because this impression reaches not to the *Callous* Body, by reason the Spirits are there amazed or stupefied, the sick know nothing what they feel or do.

Its Conjunct Cause.

The Conjunct Cause of this Disease therefore, is very often the same, but somewhat more strong, than that of the *Somnolency*, *Coma*, and *Lethargy*: The Morbific Matter is seen to possess both the *Cortex* of the Brain, and the Marrow lying under, and being carried forward, some greater bosoms of the middle part, and the upper borders of the *Callous* body; yea sometimes, as this matter is partly carried forward by degrees, these Diseases arise, and every next is but the augmentation of the former.

The Caros is either a primary Disease, or it comes upon other Distempers.

But sometimes the Morbific Cause, without any gradual progress thorow these parts, affects the middle part of the Brain at the first assault, and there (as it is more lightly or more deeply placed) causes the *Carus* or the *Apoplexy*. In which case, it is not to be thought, that the whole compass of the *Callous* Body, like the *Cortical* part of the Brain, should be possessed by the soporiferous matter: because it is sufficient, this matter rushing into any one place, and invading some part of the middle Marrow, that presently for that reason, an Eclipse, or at least a beating down of the Spirits follows, in all that region. After this manner it is wont to be, when the *Carus* comes upon a malignant or ill handled Feavour, or upon the Headach, or some Convulsive Distempers, or when it is excited by a blow on the Head, or by a fall, or by reason of an Imposthum broken in the *Meninges*: for by reason of these accidents, the interior Marrow of the Brain is wont to be so pressed together, shaken,

or

or otherways altered, that presently the tracts or paths of the Spirits are obliterated or blotted out.

The prognostick of the *Carus* for the most part is but evil, especially if this Disease comes upon a malignant, or a long continued, a gentle and not Cured Feavour, or on a Woman in Childbed, no less danger is also threatned, if it follows after other *Cephalick* Diseases, or is excited by reason of a Wound in the Head: but yet in these cases, all hope of Cure is not presently to be cast off; for I my self have observed, some sick after this manner, and esteemed desperate or past all hope, to have recovered.

The event of this Disease is wont to be various, either in Death or in health. The *Carus* passes not rarely into a soon killing Apoplexy, that after first the animadvertive faculty being lost, with a short breathing, and without motion, then by reason of the evil being transmitted to the Cerebel, there follow alterations of breathing and the Pulse, and quickly death it self.

But sometimes the Morbific Matter settling more deeply, and falling from the Body, into the streaked Body, one or both together, the Brain clears up a little, so that the sick look about them, talk, and know things, yet in the whole body besides, a Palsie, or Dead-Palsie on one side follows: but so, that life is not out of danger: for oftentimes, when the Brain begins to be restored, the Cerebel grows worse, that for that cause the Spirits there being evilly disposed or affected, which perform the offices of the vital function, and merely natural, either Convulsions are stirred up in the Bowels, and Precordia, or deadly impediments of the Pulse and respiration; yet sometimes when the Morbific matter is not so plentiful, nor very malignant, it is partly supped up into the Blood, and partly shook off, so that the sick grow perfectly well again.

The Curatory Method suggests the same intentions of Healing, and requires wholly the same Remedies, as those which are wont to be administered in the *Lethargy* and the *Apoplexy*. Wherefore, there will be no need to add here a company of Indications, nor to heap together a great pile of Medicines. But what seems more to the purpose, that I give you one or two Histories of sick people, of which I have many by me.

A known person of about forty years of Age, who having through Intemperance lost his health, took I know not what Medicines, prescribed by an *Emperick*, and fell into the *Carus*; perchance it was because the Morbific Matter being moved and agitated by the Medicine, it rushed into the Head. Visiting this Man on the second day, I found him buried in a profound sleep, and almost insensible; for although he opened his Eyes, moved his Members, when prick'd or strongly pull'd, yet presently sleeping again, he perceived nothing of what he did or suffer'd. Though in this case, I could prognosticate nothing but what was sad, however I did not desist from giving him my Medicinal help: abstaining from letting of blood, his strength being worn out, and his Blood depauperated, I took care for a large Blistering Plaster to be applied to the hinder part of the Neck, and a strong Clyster as soon as I could, to be given him, made of a Decoction of *Briony* Roots, with *Carminative* Flowers and Seeds, adding thereto of the Species of *Hiera* two drams: his Nose and Temples were anointed with Balsoms. *Cataplasms* of Rue, and the Roots of *Briony* were laid all over his Feet. Besides, every other, or every third hour, I order'd him to drink a Dose of the Spirits of Harts-horn, with a *Cephalick* Julep; yea, and I took care to have administered several other administrations, used in this case. By which, when the Disease did not wholly give place on the following day, I prescribed a Purge of prepared *Scammony* to be taken in a spoonful of Broth; by which, when he had gone often and plentifully to Stool, he began to open his Eyes, speak to, and to know those standing about him, and a little after returning to himself, he fully awaked. This Disease therefore (as I think) was easily and quickly Cured beyond hope, because that cloud, being by chance sent into the Brain by Physick, might the better be deduced thence by the help of other Physick.

A noble person about fifty, fat in body, and in time past obnoxious to the *Vertigo*, and to *Asthmatical* Distempers, using for two years Physick every spring and fall, having also a large Issue between his shoulders, lived in indifferent health: The Summer coming on, and he living in the Country, neglected his Issue for several weeks, so that the recrements there, flowed much less than they were wont; yet he was still well, till about the *Solstice* (or middle of June) when one morning cheerfully talking with his Friends, sitting in the Porch of his House, rising suddenly he complained, that he was not well; and going into the House, sitting down in a Chair, immediately leaning backward, fell into a profound sleep, and lay so buried in it, that all that

day he could not be awakened. Coming to him in the Evening, I took care to have *Phlebotomy* administred, and also a *Clyster*, a *Vesicatory*, and many other Remedies, proper in such a Case. On the next day, his Brain began a little to grow clear, so that he looked about him, and spake a few words; he seem'd to know his Friends, but could not utter the name of any; but by reason of this matter sinking down more deeply into the Brain, a *Palsie* seized his whole right side. Further, when as yet his great sleepiness continued, that day Blood was taken out of the other Arm, and also other Remedies as the former, were continued: On the third day, being less stupid, he knew many, and could tell the names of some of them, he perceived then his own sickness, and began to be careful for the taking of Remedies. But indeed, whilst his Brain grew better, the evil spread it self on the *Cerebel*, and the nervous Stock; for on the fourth day, his breathing became unequal, and more laborious, his Pulse weaker, and his whole body troubled with a stiffness, and Convulsive shakings: On the fifth day, more cruel Convulsions and Cramps did more often infect him; then his Pulse by degrees lessening; on the sixth day, though more freed from his sleeping, he dyed. In this case, and in others like it, 'tis probable that the Morbific matter did at once invade the Brain and the *Cerebel*, but whilst it stuck in the *Cortex* of this latter (contrary to what happens in the Brain) it caused no sensible hurt, because this part, which was hurt, was neither the seat of Sleep nor of the Memory; but afterwards, perhaps on the fourth or fifth day, the matter sinking down from thence, to the middle parts of the *Cerebel*, whilst as to the other Distemper the sick grew better, the vital function, by reason of the spirits destinated to it being oppressed in their fountain, began to faint, and afterwards suddenly declining, took away unexpectedly all hope of recovery, which before seemed favourable.

CHAP. V.

Of thorow or long Waking, and of the Waking Coma.

EVEN as Light and Darknes, so Sleep and Waking, being placed nigh together, best illustrate the natures of one another; so that it will be to the purpose, after the Sleepy Distempers, to discourse here of preternatural Watching, or Waking; to wit, forasmuch as it exceeding its limits, and hurting some functions, is both a Disease, and requires Cure. In this rank there are commonly two Distempers, to wit, thorow or long Waking, and the Waking Coma; of both which we will now speak in order.

Long waking is either the symptom of other Diseases, or else is a Disease of it self.

Concerning thorow Waking, we must here first distinguish, to wit, that it is a symptom coming upon some other Disease, as a Feavour, Phrensie, Madnes, the Colick, Gout, or such like; then the Cure and consideration of it belongs to that distemper, whose issue it is: or else immoderate Waking, arising of it self, without any notable sickness, is seen to be a Disease almost solitary or alone of it self. So I have known some, free from any Feavour or pain, well in their Stomach, and fit enough for their business, being in Bed, could take no more Sleep than the Dragon of the *Hesperides*. Some troubled with this kind of Waking, though destitute of Sleep, scarce seem to want it; for their Spirits appear neither sluggish, or weary, or exhausted: but others hardly bearing watching, become from thence languishing, and without Appetite, and are forced to fly to *Opiates*, which sometimes they use daily, and in a large Dose unhurt.

The cause of natural Waking consists in the restlessness of the Spirits, and the openness of the Cortical part of the Brain.

We have before hinted, that the Cause of Natural Waking, which is interlaced with Sleep, consists in these two things, either in one of them, or both together; to wit, first that the Animal Spirits being sufficiently refreshed, and freed from the stocks of the nervous Liquor, do come forth lively, and are on every side streamed forth, and chiefly from the middle part of the Brain into its circumference; then secondly, although they obtain every where an open space, and especially in the exterior compass of the Brain, then freed from the incursions of the nervous Juice, yet lest this expansion of Spirits (which is waking) should be protracted to their loss, longer than is fit, the Spirits by it being wearied, become faint, and as it were lye down of their own accord, and at the same time, the nervous Liquor being poured into the *Cortex* of the Brain, stops or shuts up their passages. Hence it follows, that preternatural

ternatural Waking, or that which is immoderate depends upon these two, either on one or both together; for either they being grown too outrageous, and as it were struck with a fury, will not lye down of themselves, or the nervous Liquor doth not so fill and stop up the Pores of the outward part of the Brain, that from thence the Spirits may be compelled inward to rest: Examples of both of these are ordinarily to be met withal.

In like manner also preternatural watching depends upon one or both.

And first of all we shall take notice, that the Animal Spirits, sometimes becoming outrageous and so *Elastick* or shooting forth, or otherways enormous, that they will not only not lye down and be quieted, but scarce be contained within the proper sphere of their emanation; wherefore, being spread abroad in continual waking, so fill the Brain, and keep it extended, that the nervous Juice though it lyes heaped up at their doors, cannot be admitted; but if it enters of it self, and the Spirits are called back inwards, from the Cortex of the Brain, presently they being forced thither, or tumultuating within the middle part of the Brain, raise up many, and often most horrid phantasies, whereby sleep is driven away; or directing thence their declination further, into the nervous Stock, there stir up great disorders, which continually drive away, and break off Sleep, though it seems ready to creep upon them.

The former means described, by shewing how many ways the unquiet or elastick Spirits stir up long waking.

As to the former of these, I have often observed, that some being disturbed with waking, were afraid to sleep, though desiredly coming upon them; for as soon as they shut their eyes to sleep, presently leaping up, they would cry out they should grow mad, with a multitude of confused phantasies, so that they were necessitated to abstain from sleep.

First, Because being recalled for Sleep into the middle part of the Brain; they grow tumultuous.

Secondly, whilst the Spirits become more outrageous, and are for sleep sake recalled towards the interior compass of the Brain, sometimes they convert their rage into the nervous Stock, and then tumultuarily rushing in upon the Nerves, destinated for the Precordia, or the Inwards, raise up inordinations in the respective parts: hence in those thus distemper'd, as often as they shut their eyes to invite sleep, either tremblings, leapings, and binding up of the heart, with loss of Spirits, and breathing stopped, or inflations, and rising up of the Bowels, with a sense of choaking, and other symptoms commonly called or taken to be *Hysterical*, follow: or else secondly, the Spirits being recalled from their watches, and turning on the nervous Stock, transfer their rage sometimes on the spinal Marrow, and the Nerves reaching from thence into all the exterior Members: Wherefore, in some, whilst they would indulge sleep, in their beds, immediately follow leapings up of the Tendons, in their Arms and Legs, with Cramps, and such unquietness and flying about of their members, that the sick can no more sleep, than those on the Rack. Once I was consulted with for a noble Woman, who was in the day-time cruelly tormented with the pain about the heart, and Vomiting, but in the night she was hindred from sleep, though it seemed to approach, by reason of these kind of Convulsive Distempers invading her, with it; nor indeed could she sleep all the night, unless she had before taken a large Dose of *Laudanum*; wherefore, this Medicine at first being permitted her, only twice a week, afterwards she took it daily for three whole months, contracting by it no hurt, either in her Brain, or about any other function; and when in the mean time, by the use of other Remedies, the *Dyscrasies* of the Blood and the nervous Juice were amended, and the Animal Spirits were made more benign and gentle, she having after that wholly left off her Opium, could sleep indifferently well. These kind of sleep-destroying Distempers, stirred up either within the middle part of the Brain, or within the nervous Stock, either more inward or more outward, do depend wholly on the evil constitution of the Animal Spirits: for those who ought to be gentle, clear, and bright, and to actuate gently the containing bodies, and to influence them with a benign influence, become sharp and fierce, and like Effluvia's sent from *Stygian Waters*, unable to be restrained, do distend them too much, and refuse to be governed by the command of the will, and to be quieted by sleep; yea being restrained in one place, they immediately grow tumultuous in another. Such a constitution of the Animal Spirits proceeds from the acid, and oftentimes as it were Vitriolick *Dyscrasies* of the Blood begetting it, and of the nervous Juice cherishing and increasing it: as shall be more fully shewed hereafter, when we speak of madness.

Secondly, Because being called back into the nervous Stock, they impetuously leap forth.

And so, either into the interior Nerves, serving the Precordia and Viscera; Or, into the Spinal Marrow; and the exterior Nerves.

In the mean time, as to what belongs to the Cure of thorow or long waking, (which we but now described) because it cannot be long tolerated, therefore those things, which may bring present ease, ought first to be administred; for this end, those things which sooth the Spirits, and gently moderate their disorders, are convenient, as those commonly called *Anodynes*, viz. Distilled Waters, Decoctions, Syrops, and Conserves of the Flowers of Water-Lilies, Cowslips, Mallows, Violets, Hearts-ease,

The causes of the aforesaid Distempers assigned.

The Cure of them declared.

Hearts-ease, of the leaves of Willow, Lettice, Purslain, also Emulsions, or Juicy expressions. If that the unquiet Spirits will not be allayed by gentle flatteries, you must compel them into quietness, as it were with bouds and strokes: plenty of them ought to be diminished, and the places also to be enlarged, in which they may expand themselves in freedom, and without tumult, and quitted from the intanglements of other Humors, to wit, of the Blood and Serum: For which ends, sometimes the opening of a Vein is convenient, and Blisterings are always to be made use of; also *Diatodum*, and *Laudanum*, if it be convenient, are frequently given; and in the mean time, whilst that *Opiates* give some truce to the Disease, the cause of it ought carefully to be rooted out by the use of other Remedies, as much as may be; wherefore, such as take away the sharpness of the Blood and nervous Juice, and render a sweetness to them, are to be administered, day after day, in Physical hours: In which rank are *Sticky Powders*, *Apozems*, and *Distilled Waters*; *Alterers*, made out of temperate *Anticorrupticks*; the more gentle prepared *Chalybeats*, *Spirits of Harts-horn*, and of *Sut*, and almost before all other things, the *Tincture of Antimony* is much esteemed.

The second sort of thorow or long waking, arising both from the too much openness of the Brain, and from the unquietness of the Spirits.

Its foreleading Cause.

which also causes waking in Melancholick People.

For the same reason Coffee causes waking.

There remains another sort of thorow or long Waking, the cause of which in some, if not in the greatest part, consists in almost a continual openness, or too much gaping of the Pores, or passages in the *Cortex* of the Brain: For besides, that the *Animal Spirits* becoming sharp, and somewhat outrageous, refuse to lye down of their own accord, and to indulge rest; moreover, no stop or yoke is imposed upon them from the nervous *Liquor*, entering into the Pores of the Brain, but being free and quitted of all burthens, they are also expanded within the exterior spaces of the Brain, every where open: wherefore, for this cause, those troubled with long Waking, feel no sleepiness or heaviness in the fore part of their head, no desire or approach of Sleep. I have known some distemper'd after this manner, who, when they had lived for many nights continually without Sleep, seemed still chearful, active, strong in their stomach, and ready for business, and not to want Sleep. The cause of this without doubt is, because the burnt and melancholy Blood, supplies the exterior part of the Brain with a nervous Juice, that is not soft and favourable, but too much parched, and stuffed with adust particles, which, for that reason, is apt neither to stay long within the Pores of the Brain, nor gently to embrace and hold the *Animal Spirits*. Further, the *Spirits* themselves, procreated out of it, become of their own nature too *Elastic*, and unquiet, so that they are not easily settled, or are prone of their own accord to Sleep: But these more fixed, do not readily fly away, nor being wearied, do suddenly grow faint, but indure for a long time, without any great refection, and yet remain lively. Concerning this waking disposition of the *Animal Spirits*, as it is the same in *Melancholicks*, we shall have an opportunity of speaking of it more largely hereafter. We may also here take notice, that for the same reason (to wit, that the adust Particles of the Melancholick and torrid Blood, being poured into the Brain, together with the nervous Juice, causes waking) the drinking of *Coffee* also, (in use formerly among the *Arabians* and *Turks*) which is drunk by our Country Men, either Physically or out of wantonness, all sleepiness being driven away, doth produce unwonted waking, and an unwearied exercise of the *Animal* faculty; that some having a necessity to study late in the night, or presently after drinking, or a full meal, by drinking a due quantity of this *Liquor* become still waking, and perform any hard task of the mind, without sleepiness. Surely the cause of this is, because this drink insinuates adust particles (of which it is full, as may be perceived both by the smell and taste) immediately into the Blood, and then into the nervous Juice; which still detain the pores of the Brain open, by their agility and inquietude, and add to the *Spirits*, all sleepiness being shaken off, certain provocatives, and madness, by which they are excited to a longer performance of their offices. Further, we shall deliver afterwards, where we speak of Melancholy, those things which belong to the preventive Cure of this long waking, or the removing of the Morbific cause: In the mean time, for the taking away immediately this symptom, as often as it is grievously troublesome, we noted that *Opiates* were little profitable; for a bare Dose being given, doth rarely cause sleep, and render the sick more weak and languishing: It often better succeeds, if they go to bed, and take some soft and pleasing *Liquor*, as our own Ale, clear and mild, or *Possët-drink* with Cowslip Flowers boiled in it, or an Emulsion of Melon Seeds, and Almonds in a great quantity, to wit, two or three pints.

An History shewing an example of this Disease.

I was some times past consulted with about an old *Hypochondriacal* person, who besides other Symptoms usual in that case, was for many years obnoxious to frequent, very troublesome, and noisie belchings: he was wont every day, two or three times, for about two hours, continually to belch, with such a noise, that he might be heard far and near, at a great distance: But sometimes for a week or two, and sometimes for

for a month, this belching would be changed into a long waking, for having that Distemper much remitted, this Gentleman was kept without sleep almost whole nights; and when he had thus been for three days, and sometimes more, perfectly waking, he seemed not to want sleep, and complained not of sleepiness, dulness, or languor of spirits. And when *Narcoticks* rarely brought to him any help, he took sometimes in the evening a Posset made of Ale and Canary Wine; and night coming on, he sometimes drunk Distilled Waters, by the use of which, oftentimes he got some sleep; then afterwards, his waking perfectly vanishing by degrees; his belching returned. Hence it appears, there was but one cause for either, to wit, the adust particles, and irritative, being poured forth from the bloody Mass, sometimes into the coats of the Ventricle, and sometimes into the Cortical part of the Brain.

Secondly, besides these distinct Distempers of Sleep and Waking, or their inordinations, there remain other conjunct, or complicated irregularities of them, in which, the acts of either function are prevaricated together. Which indeed is observable in that Distemper or affection called the *Waking Coma*; of which we shall now speak briefly.

Those sick with the *Waking Coma*, although they are continually prone to Sleep, yet they can scarce sleep at all, but after the manner of *Tantalus*, up to the chin in the *Lethæan River*, to taste which as soon as he stoops down, the water slides away from him and sinks lower. For they feel a cruel heaviness in their Heads, with a sleepiness or numbness of all their senses, and faculties, that they hardly endure to turn themselves in their Bed, or to be disturbed by the by-standers with talking, and expect they shall presently fall into a sweet sleep; but when they would indulge it, and endeavour strongly to embrace it, various phantasms rolling about in their mind, keep them still waking; neither are they suffered to take any sleep at all, which seems to them to be still at hand. Upon this, not seldom follows a *Delirium*, that whilst the sick lye with their eyes shut, they perpetually talk absurd and senseless things, and sling about higher and thither their Arms and Legs excessively, and being raised up, they look about them doggedly. It is an usual thing for those sick of Feavours, to remain a whole night as it were drowned in sleep; and in the mean time are scarce silent a minute of an hour, but murmur various things to themselves; also sometimes cry out, houl, and leap out of Bed. If the reason of these be inquired after, we may say, that the Pores and passages in the Brain, which are the walking places of the Spirits, are very much possessed with a thick and soperiferous matter, poured forth from the Mass of the Blood, that the Spirits being very much hindered from their wonted expansion, and mutual commerce, an heavy and invincible sleep seems to hang over them; but because some sharp and highly active particles, like so many goads, cleave to these Spirits, they are perpetually incited into motion; and so some of them break thorow the ways, howsoever fast shut and stopped with mounds, and run forth either directly or obliquely as they can; and thus such motions of theirs, however confused and diverted, by reason of impediments, and not able to exercise compleatly the Animal function, yet they easily drive away or hinder its cessation and rest; for this reason indeed, such who are distemper'd with this Disease, are like those living under the Pole, who only see (when the Sun is in the *Equinox*) the light on the *Horizon*, and have neither perfect night, nor perfect day; so these only enjoy a kind of twilight betwixt sleep and waking.

The *Waking Coma* is rarely a Disease of it self, but for the most part it is a symptom coming upon other Diseases, as the Feavour, Phrensie, Lethargy, and the like; wherefore it requires not a Curatory Method peculiarly, but there is only need, that to the Remedies prescribed for the first or primary Disease, there should be added other *Cephalicks*, which may dispel these clouds and meteors of the Brain; or if both will not be expelled together, the same Medicine which cherishes the parts of the one, getting the better, will immediately overcome the other: so in the *Waking Somnolency*, it is convenient to procure either perfect sleep, or perfect waking, and in this case I have often given *Narcoticks* with good success.

A description of the waking Coma.

The cause of this Distemper shewn.

It is more often a symptom of other Distempers than a Disease of it self.

C H A P. VI.

Of the Incubus, or Night-Mare.

The Seat of the Incubus is in the Cerebel.

THUS much concerning the morbid exorbitancies of irregular sleep and waking; which are almost proper, and as it were of the region of the Brain, and affect not the *Cerebel* but rarely, and that secondarily and collaterally, as hath been shown. But there remains a distemper, commonly called the Night-Mare, in Latine the *Incubus*, which is both peculiar to this Region, and also seems in some measure analogical to the sleepy diseases; forasmuch as its fits arise, for the most part from sleep, by reason of the Animal Spirits being bound in the *Cerebel* or suppressed; their eclipse or interruption (though short) about the exercise of the vital function, is induced.

A Description of it.

That the subject, nature, and causes of this Disease may be the better known, we shall first consider its *Phænomena*, or the appearance of it. The fits of the *Incubus*, or Night-Mare, for the most part, and indeed only falling on one in sleep, are used to be excited mostly after the stomach is loaded with undigested meats, and lying on the back in Bed. They who labour with it, seem to feel the hurt chiefly in the Breast, and about the *Præcordia*, for respiration being suppressed, and very much hindered, they think that a certain weight lying heavily upon their Breast, doth oppress them; which weight mocks their imaginations with the Image of some spectre or other; and this, whilst they think to shake off, or put away, by the moving of their Body or members, they are not able to stir themselves any way: But after a long space, and sometimes till they are almost dead, they at last awake with a struggling about their heart, and being more fully roused from sleep, the imaginary weight suddenly vanishes, and the motive force of the body is restored, but for the most part a trembling of the heart remains, and frequently a swift and violent beating of the *Diaphragma*. Then the fit being over, the deception of the phantasmie, conceiving the horrid image of the *Incubus* or spectre, is perceived.

It most often proceeds from natural causes.

The common people superstitiously believe, that this passion is indeed caused by the Devil, and that the evil spirits lying on them, procures that weight and oppression upon their heart. Though indeed we do grant, such a thing may be, but we suppose that this *symptom* proceeds ofteneft from mere natural causes; though what they are, and in what place the Morbific matter doth subsist, is not agreed on among Authors, nor indeed is it easily to be assigned.

The Seat of this is falsely placed in the Brain.

Because the imagination is deceived, and the error being propagated further into the senses themselves, so imposes on the sight and feeling, that they believe they plainly see and feel a monster of this or that shape or figure lying upon them; and for that the loco-motive faculty of the whole body is hindered, in the mean time; some have placed the seat of this Disease wholly in the Brain, and would have the oppression of the breast to be merely phantastical: But although we grant the monstrous shape of the *Incubus* (which is conceived) to be a mere dream; the *Præcordia* to be truly affected, is apparent, and the motion of the Pulse and breathing is suppressed or hindered; for that the heavy weight of the breast is plainly felt by most, in their waking, yea, and when thorowly fresh awaked, and when that is removed, the tremblings of the Heart and *Diaphragma*, and inordinate motions follow: whence it follows that these parts labour and suffer a real hurt.

The *Præcordia* truly labour.

The cause doth not stick partly in the Brain, and partly in the Breast.

Wherefore others, that they might the more easily unloose this knot, dividing the Morbific Cause, assign a portion of it to the Brain, and another to the Breast; for they say, that the motion of the Lungs are hindered, by a viscus and very gross humor impacted about them, and that doth excite as it were the oppression of a bulk lying on them, with want of breathing; then Vapors being raised to the Head, do fill the principal Nerves, and so hinder the loco-motive force: which opinion (no more likely than the conceptions of those troubled with the Night-Mare) deserves not to be assented to; because there are not any signs of this humor heaped up about the *Præcordia*, which appear before or after the fit, yea when this region is very much burdened, as in the *Phthisis*, *Asthma*, or Dropsie of the Breast, the *Incubus* does not therefore infest more frequently or more grievously: Further it appears not, how the matter heaped up in the *Præcordia*, should be only troublesome in sleep, or by what passage or way, the Vapours from thence so suddenly inducing want of motion, should be

be elevated to the Head. Wherefore, the Reason or *Ætiology* of this Distemper, I think to be taken or judged of far otherwise.

Therefore this heavy weight or load lying on the breast, seems indeed to be left, because the motion of the Heart, and the organs serving for breathing, is hindred; for from the motion of the heart ceasing, or being hardly performed, the Blood in its bosoms, and in the breathing or *Pneumonical* Vessels statgnating, and being there very much streightned, a sense of as it were a weight opresses the region of the breast, which also seems therefore the more grievous, because the Lungs, *Diaphragma*, and Muscles of the *Thorax*, being hindred in their motions, and as it were bound together, at the same time with the heart, do labour with a great endeavour, to exercise or to put forth themselves. But the most hard question yet is, concerning the Cause, by reason of which the motion or action of the *Præcordia* is suppressed, or hindred. This seems impossible to be done by matter impacted in the organs themselves, of which indeed, there must be a very great deal, to suffice for the hindrance of so many parts, and some signs of it at least would appear somewhat out of the fit; wherefore, it seems that we may rather say, that the action of those parts are hindred; because the influx of the animal spirits are hindred or suppressed. This is frequently done in Convulsive Distempers; as we have elsewhere declared, and have clearly shewed by *Anatomical* Experiment, to wit, by tying the trunk of the Nerves of the eighth pair, in a living Dog: But in those distemper'd by the *Incubus* or Night-Mare, the obstruction of the Spirits, seems to be excited neither in the organs themselves, nor in their Nerves; for such a cause happening to those awake as well as to those sleeping, doth not become presently moveable, but is fixed and permanent.

Wherefore, we think the fit of the Night-Mare to be induced, for that in sleeping, a certain incongruous matter is instilled into the Cerebel, together with the nervous Juice, which causing a certain torpor or benumbedness in the first spring of the spirits, compels them immediately, by little and little, to cease from the offices of their functions; so that as it were another Lethargy being excited within the Cerebel, the vital actions suffer a short eclipse; during which, partly from a strife of the obstructed or bound together *Præcordia*, and partly from the blood very much heaped up and statgnating in them, that weight, or a sense as it were of a great bulk lying on them, is caused; then, because all the rest of the faculties depend upon the motion of the heart, therefore this being suppressed and hindred, presently those eclipses or disorders of them follow; but especially because the flowing of the Blood into the Brain, for the making of Animal Spirits, is interrupted, therefore immediately the flowing forth of these into the nervous *System* is suppressed, so that the sick, whilst they endeavour to shake off the imaginary load of the breast, are not able to move their Body, or any member; to wit, because the irradiation of the Spirits, (whilst they are destitute of the flowing in of the Blood) is kept from the moving parts: In the mean time, those which reside in the Brain, being spread abroad here and there, conceive confused phantasms, and from the trouble impressed from the *Præcordia*, horrid dreams of spectres.

The fit of the *Incubus* is soon ended, because the matter, rarely or never entring deeply into the Cerebel, is easily shaken off, or is supt back again into the Blood: for after the spirits became free from its embrace, and having got the liberty of motion within their wonted spaces, they repeat the exercises of their functions: wherefore, the afflux of the Blood then presently returning to the Brain, immediately the afflux or flowing forth, and emanation of the Spirits, are restored, like a light new kindled, both in its middle or marrowy part, and also in the nervous Stock: whence they being awakened, the motive force returns, and the error of the imagination is perceived. But that there follow in the Heart and *Diaphragma* tremblings and most swift hearings, the reason is, because these Bodies, so long as they were hindred from their motions labouring with an endeavour of exercising, or putting forth themselves, are not able to contain themselves within their just limits, as soon as they are restored, but putting forth at once all their strength, and being too active, exceed the due performance of their duty: even as a wand, being held a while bent, being afterwards let go, recovering it self with a certain force, enters into a motion of trembling or shaking.

After this manner, the fit of the Night-Mare, because it immediately stops the vital function, as it were the first moving wheel in the animal Machine, compels forth with all the other faculties to cease, yea the whole corporeal soul (more than the more grievous fits of the *Apoplexy* or the *Lethargy*) to shake, and as it were to suffer an eclipse: Notwithstanding, little danger is threatned from this Distemper, because the Morbific matter being poured forth from the Blood, into the compass of the Cerebel,

The next cause of this is, the hindrance of the inflowing of the Spirits to the *Præcordia*.

This not in the Parts affected;

Nor in the Nerves themselves:

But happens in the Cerebel, where the first Spring of the Spirits is.

From whence the sense of the weight proceeds. Whence loss of motion proceeds.

Wherefore the fit being so grievous, is so soon ended, without leaving any evil.

Whence after the Fit, the tremblings of the Heart and the *Præcordia*.

The *Incubus* of its self rarely dangerous.

Cerebel, is not suffer'd to penetrate deeply; because the Spirits of that province, being always in a readines and watchful, most swiftly run to meet the enemy, and oppose his entrance strongly, though the offices of the vital function be omitted in the mean time; further, the Animal Spirits which are in the region of the Brain, being awakened, fly presently to assist those of the labouring Cerebel: For those sick of the *Incubus*, if by chance they be awakened by any one lying with them, they sooner come out of the fit.

The Prognostick
of the Incubus.

But although it is rare, that any one dyes of this Disease only; yet those often obnoxious to it, if they are taken with other *Cephalick* Distempers, as the *Lethargy*, *Carm*, *Apoplexy*, or the *Epilepsie*, are in far greater danger: because the Morbific matter, being poured forth from the Blood into the Brain, easily invades the Cerebel so predisposed; so that the sick therefore suffering at once an eclipse of the vital and the animal function, are brought into greater danger of their Life. Hence 'tis a vulgar observation, that those who frequently are troubled with the *Night-Mare*, fall into the *Apoplexy*.

The Event of it
is shewn.

There is wont to be another event of the *Incubus*, less dangerous, that leads often into the *Cardiack* passion, and other affections, commonly taken to be *Hypochondriack*. I knew several while young, grievously afflicted with the *Night-Mare*, who being freed from it in their riper Age, were troubled with the trembling and palpitation of the Heart, and other pains about the *Præcordia*, and *Hypochondria*; and also with Convulsions in those parts. We think the cause of this morbid commutation to be, because the Morbific matter, after it was wont so often to besiege the region of the Cerebel, at length an impression being made, it did penetrate more deeply into some private place, and passing thorow its frame, became impacted on the Nerves destinated to the *Præcordia*.

As Cure.

As to the Cure of this Disease, there needs no help for the fits, because they pass away quickly of themselves. The method of Cure after a considering the whole, suggests Blood-letting, (where it is convenient) and a gentle Purge, and chiefly the use of Remedies, which are commonly called *Cephalicks*. Therefore, here Powders of *Amber*, *Coral*, and *Pearls*, with the Roots of the *Male Pæony*, *Cretick Distanny*, *Contrayerva*; also *Electuaries*, *Tablets*, and *Distilled Waters*, *Tinctures*, *Elixirs*, and other things that are wont to be prescribed in the *Lethargy* and *Apoplexy*, have the chief place; but especially a right course of dyet being ordered, let gross and ill digested meats be shunned, Pulse and Summer-fruits; nor let sleep, study, or reading be presently yielded to after eating: late and large Suppers, and lying on the back, are to be forbidden.

Infants and Boys
obnoxious to this
Disease, how
they ought to be
banded.

Because Children and Youths, are often sick of this Disease (the sign of which is, that they are shaken in their sleeping, and waking cruelly cry out) and more often suffer its fits, which oftentimes bring them to Convulsive passions, therefore a method of healing them ought to be administered, as soon as they are seen to be distemper'd: you ought to inquire into the milk they suck, whether it be of it self pure and laudable, and truly convenient for the Stomach: let them not sleep presently after they have sucked their fill: The Nurse using a good dyet, let her take also Morning and Evening a Dose of *Cephalick* Powder, or *Electuary*, drinking after it a draught of Posset drink, with the leaves of Sage or Betony, or the Roots or Seeds of *Pæony* boiled in it: Let the Infant take twice a day, a spoonful of proper Distilled Water. Let him have an Issue made in the nape of the Neck, and let it lye sometimes on one side, and sometimes on the other, and rarely or never on its back. If a Neck-lace of Coral, or little balls of the Seeds or Roots of the *male Pæony* be worn about the Neck, or at the pit of the Stomach, it is not altogether useless; if that in sleep being often and grievously shaken, they are seen to be more dangerously troubled with this Distemper, let Blisters be raised in the hinder part of the Neck, or behind the Ears; also Evening and Morning let there be daily given a Dose of the Powder of *Ammoniacum*, or other proper Dose, in a spoonful of Distilled Water or *Julep*.

C H A P. VII.

Of the Vertigo; or a turning round in the Head.

HAVING viewed the exterior compass of either part of the Head, and detected the Diseases which beset the sensitive soul, about the first beginnings, and last Springs of the Animal Spirits; we shall next descend to the middle part of the Brain, where the phantasie and common sense reside, and behold what kind of passions these parts are obnoxious to. Concerning this in the first place we shall note, that sometimes troops or rather mighty armies of Spirits, inhabiting these places, are affected, and sometimes also small handfuls or bands: then again many of them are affected together, or else only a few at a time; or they become Elastic from an heterogeneous *Copula*, and so are compelled into inordinate motions, or as it were explosive or shooting off, as in the *Epileptick* fit; or suffering an *eclipse*, as in the *Apoplexy*, are deprived of all motion. Concerning the former disposition of the Spirits, we have formerly treated largely enough, and the astonishing Disease we shall handle afterwards. But in this place, we shall speak of a certain Passion or distemper belonging to these parts, *viz.* the *Vertigo*, in which a certain band or handful of the Spirits are affected, and their motions are seen to be partly perverted, and partly suppressed.

The Seat of the Vertigo.

Being but little solicitous about the names by which the *Vertigo* is wont to be known, we shall describe the nature, or formal reason of it after this manner, *viz.* "The *Vertigo* is an Affection or Distemper, in which the visible objects seem to turn round, and the sick feel a perturbation, or confusion of the Animal Spirits in the Brain that they do not rightly flow into the Nerves: Wherefore the visive, and the loco-motive faculties, do often in some measure fail, that those labouring with it fall, and oftentimes are covered with darkness."

A Description of it.

In this fit it is observed, that the imagination and the common sense are in a manner deceived, whilst they believe, the quiet objects to be moved, but the rational judgment remains; for we understand our error, and we presently ascribe this fallacy to the inordination of the Animal Spirits; for that we plainly know that the spirits flowing within the Brain do decline from their wonted irradiation or beaming forth, and do not rightly perform the offices of motion and sensation, during the fit.

That we may find out the Morbific Cause, and the preternatural manner of the *Vertigo*, we shall inquire after what manner this same affection or Distemper, how temporary or sudden soever it be, is wont to be excited from non-natural things; for men ordinarily become Vertiginous (or have a turning in their head) with a long turning round of the body, looking down from an high place, passing over Bridges, Sailing, and by Drunkenness, and many other ways. It will be worth our while to consider a little further, the means of affecting, by which these exterior actions stir up this turning or rolling about, from whence it will the better appear, what kind of intrinsic causes may be able to excite this passion. In the first place therefore, when men are for some time turned about, both in that motion all things seem to be turned about, and also they ceasing from turning about, that still continues in the phantasie; so that the affected oftentimes fall to the ground; further, though they shut their eyes, they still perceive as it were a turning round, like the turning about of a Mill, in the Brain.

The Causes and the Manner of the non-natural Vertigo.

The reason of these is not, that the deception of the sight is first brought to the eyes, and afterwards continued for some time; because this affection is caused by the turning round of the body, whether they look with, or shut their eyes: But indeed the cause of this apparition wholly depends upon the fluid substance of the animal spirits. For that the spirits flowing within the Brain, are even like to water, or a thick heap of Vapors, included in a Phial, which being shaken round about, together with the Vessel, and made so to turn about, continues for a time that motion, though the Vessel stands still; in like manner also, when the body of a man is turned round about, the spirits inhabiting the Brain, from that turning about of the Head, like the containing Vessel, are agitated into spiral or round motions; and when therefore they cannot irradiate the Nerves with their wonted influx and direct beams, from hence oftentimes a *Scoromy* or dizziness, and a failing of the feet, together with a rotation or whirling about of visible objects, are induced. The visible Hemisphere seems to turn round, because as the sensible impression

The Reasons of them shewn.

sion is received by the means of the recipient, so the objects, as the spirits, seem to be moved round about.

Why looking down from on high, and passing over Bridges, cause a turning round in the Head.

Secondly, looking from on high, and passing over Bridges, stir up a *Vertigo* or giddiness in the Head, for that there is a terror cast on the imagination from unaccustomed objects, as also from the site of the body, or going in danger, whence that being very solicitous, how it should rightly order and more firmly direct the spirits into the bodies of the Nerves, calls them back into the middle part of the Brain, and so perverts them from their wonted afflux and irradiation; and whilst it endeavours to set their battel in better array, and to direct them more surely, by too great a care, drives them into a certain confusion and irregular motion. Wherefore 'tis observed, that drunken men, and very bold, because they are not careful or solicitous concerning the guiding of the animal spirits, suffer no such thing. Sailing, or riding in a Coach, causes a turning in the Head by the like reason, as the turning round of the Body; because, the very fluid spirits being too much agitated, like water shaken in a Glass, leap hither and thither disorderly. Further, it is wholly for the same reason, why many going by Ship, or by Coach, are subject also to cruel Vomiting; to wit, because the spirits being snatched into disorder, by too great a motion, and confused fluctuation, run inordinately into the heads of the Nerves of the wandering pair, and for that reason stir up Convulsions and Convulsive motions in the Bowels.

How Drunkenness.

Thirdly, 'Tis observed, that the *Vertigo* comes upon Drunkenness, as a known symptom; and that to those unaccustomed, the drinking, though moderately, of Wine or strong Ale, also the taking of *Tabaco*, easily induces the same affection; the reason of which is, because from the Liquor, or vapour so taken, certain fierce particles, and untameable, are carried into the Brain, by the passages of the Blood and nervous Juice; which being improporionate, and incongruous to the Animal Spirits, drive them hither and thither from their wonted tracks of flowing and reflowing or ebbing, and so move them into whirlings, and turnings about.

A perturbation of the Spirits in the Brain, and a revocation of them from their flowing into the Nerves, depend mutually on one another.

These are the chief occasions, or solitary evident causes, which do use to bring the *Vertigo*, or turning round in the Head to some men, how sound of constitution soever they be: which kind of effect, these occasions produce, forasmuch as the Animal Spirits, being disturbed beyond their set courses, and orders, are moved inordinately, fluctuating here and there, both within the passages of the Brain, and also some of them, like a thred broken off, from their wonted irradiation, into the nervous Stock. For these being always reciprocal, depend mutually one of another, to wit, a perturbation of the Spirits within the middle part of the Brain, and their flowing forth into the nervous Stock being hindered; for from what ever cause either effect is induced, the other immediately follows. A turning round of the body, going in a Coach, or in a Boat or Ship, also Drunkenness, and the unaccustomed fume of *Tabaco*, compel the spirits in the Brain to fluctuate and shake disorderly, which, for that cause, are presently inhibited from their wonted flowing into the Nerves, that those so affected, can hardly go or stand; in like manner, on the contrary, looking from on high, passing over Bridges, a languishment or *syncope* falling on them, recal the spirits from their wonted emanation, who, for that cause tumultuating within the Brain, or being moved inordinately, cause a *Scotomy* or dizziness, or a turning round of the objects.

From what causes the preternatural *Vertigo* is wont to be excited.

These things being thus premised, concerning the *Vertigo*, raised up by reason of an outward accident, or from a solitary evident and non-natural cause; we shall next inquire, how and by what means, it is wont to be induced, from an intrinsick and preternatural cause.

Concerning these take notice, that the *Vertigo* is sometimes a symptom depending upon some other Distemper, placed sometimes within the Brain, and sometimes without it: but sometimes this is a Disease of it self, which being raised up within the middle part of the Brain, becomes very troublesome, and often terrible, and very hard to be Cured.

Sometimes the *Vertigo* is a symptom of other Cephalick Diseases.

As to the former, many *Cephalick* Diseases (or such as belong to the Head) viz. Acute pain, the *Lethargy*, *Epilepsie*, *Carus*, *Apoplexy*, with many others, do often accompany the *Vertigo*; to wit, because the equal expansion of the Spirits in the Brain, and therefore their irradiation into the nervous Stock, from such like various Morbific causes, are easily hindred or disturbed; as shall hereafter appear, when we deliver the *Aetiology* or reason of the *Vertigo*, as it is a Disease of the Brain.

Sometimes it is excited by reason of the Distemper of other

But sometimes this symptom is wont to be produced, by reason of other Distempers, placed a long way from the Brain, and that chiefly by two ways or means. For first it is usual for a dizziness to arise, by reason of the flowing of the Blood being suddenly

denly called away from the Brain, as in a *Syncope* or Swooning, great want coming near it, wicked hard labour great *Hæmorrhagies* or expence of blood, long fasting, in passions of violent sadness and fear; yea by reason of other occasions, when the motion of the blood is deficient or fails in the heart; so that the affected are proclive to faintings and swooning away; presently, because the tribute of the vital liquor is withdrawn, the animal Spirits growing deficient in the Brain, withdraw their radiation from the nervous Stock; for when their spring is cut off, those that remain, leaping back from their emanation, wander about confusedly in the Brain, and very often stir up the Vertiginous Distemper.

Secondly, an inordinate recourse or flowing back of the Animal Spirits, from some inward, or from some outward member, often causes the *Vertigo*: forasmuch as the Spirits being disturbed from the affected part, by a long series, thorow the passages of the Nerves, at length disturb others inhabiting the middle part of the Brain, and drive them into the like disorders; for this cause it is, that sharp humors gnawing or pulling the Fibres of the Ventricle, because the infestous and irritative matter being moved in the Spleen, *Pancreas*, or Intestines, causes light dizzinesses in the Brain. I have known from an acute pain, an Ulcer, or a mortified Inflammation in the Foot or Arm, frequent tremblings and failings, though short, in the Brain, to have been induced. Whilst that the conceived inordination of the spirits, is transferred from the distemper'd part, thorow the Nerves into the Brain, a certain Formication or tingling, or as it were the ascent of a cold air, is seen and perceived; wherefore the cause of this Distemper is commonly ascribed to Vapours, arising up to the Head: which error we have elsewhere sufficiently confuted. Further, many are wont, when they have fasted, or stayed long beyond their hour of dining, to have a dimness before their eyes, and their heads to have a turning, and then afterwards those clouds vanish, having eaten a little; this does not so happen (according to the vogue of the people) for that wind or vapours ascend to the Head, from the empty Stomach, which the aliments being taken in, do immediately suppress; but because the Fibres of the Ventricle, and the nervous Filaments or little strings, being destitute of the nervous Juice, with which they desire to be watered, are wont to enter into corrugations or wrinklins, and light Convulsions, which kind of Convulsions and disorders of Spirits, for that they are continued thorow the passages of the Nerves, into the Brain, produce the Vertiginous Distemper; which, as soon as the Fibres of the Stomach remit their wrinklins, ceases of its own accord. For this reason I have known some, by a Vomit being given, tearing the coats of the Ventricle, to have been taken with a cruel *Vertigo*: yea I do suspect, that this Distemper does sometimes arise from meats of ill digestion, and ungrateful to the stomach.

But the *Vertigo* is not only a *symptom*, but sometimes a primary Disease of it self; whose nature, that we may the better search into, we ought to inquire into its subject, the formal reasons, and causes of it; and then these being found out, and truly unfolded, we will proceed to its prognostick and Cure.

Without doubt the immediate subject of the *Vertigo* are the Animal Spirits, which every one labouring with this Disease finds to be greatly disturbed, and wandring up and down; but the mediate subject are those parts of the Brain, in which the Imagination and common sense reside, and whence the next way lies into the nervous Stock. These are the Callous and streaked bodies.

For indeed, the Animal Spirits love to expatiate themselves, and to be expanded or stretched forth on every side, within these medullary places, as in a most ample Field, and pleasant Garden; wherefore like beams of light, with a full and streight ray, they pass thorow all the Pores and most thick passages of the marrow: hence it is, that whilst they gently flow in one line, from the outmost border of the Callous body (to wit, from the streaked bodies, and turnings and windings of the Brain) towards its middle part, they represent pleasant imaginations and phantasies; and whilst in another line they flow forth, perhaps thorow other passages from the middle of the Callous body, into the infoldings or windings about of the Brain, they transferr thither signets or marks of notions for the Memory; and then, whilst they tend into the streaked bodies, and the beginnings of the Nerves, they actuate all the moving parts, and carry to them, as often as there is occasion, the instincts of the motions they are to perform.

But in the *Vertigo*, these equal emanations of the Spirits, as it were rays of light, seem to be intercepted, and diversly perverted in various places; because some bands or handfuls of the Spirits are obscured, others are bended another way, and moved hither and thither into turnings round and whirling about, and oftentimes snatched transverse, or cross one another. Wherefore, confused phantasms, wandring and inconstant

distant parts, viz. from the stomach, spleen, &c. and so by two means:

1. Either by reason of the Flood of the Blood being kept back.

2. Or by reason of an inordinate recourse, or flowing back of the Spirits towards the Brain.

Not by reason of vapours, elevated from these parts is it excited.

The immediate Subject of the *Vertigo* is the Animal Spirits.

The mediate the Callous Body.

its formal reason.

stant images, or actions of sensible things are represented, in the Brain, by reason of the Spirits so disturbed: Then forasmuch as the irradiation into the nervous stock is lessened or hindred, a dizziness and failing of the motive function follows.

If that we should yet further inquire into what hinders or obstructs the ways, whereby the Spirits are compelled thus to go aside, or tumultuate within the Brain; it seems probable, that these inordinations of theirs do depend upon a two fold cause, viz. first, that certain fierce and extraneous Particles, being entred deeply into the Brain, together with the nervous Juice, stick close to the spirits, and move them into enormous motions; but this, as appears from common experience, happens to every one, on the immoderate drinking of Wine or Strong-waters, or the unaccustomed taking of Tobacco, by the eating of some Vegetables, or being anointed with Mercury; for that some Heterogeneous bodies and infestous to the Spirits, follow them, and are snatched with them, even to the middle part of the Brain: why may not such kind of Morbific particles and Vertiginous be supplied from the Blood, and other humors very much vitiated, and insinuated into the inmost conclave of the Brain?

Its Conjunct Cause.

1. From the perversion of the Spirits.

2. From their ways or passages being obstructed.

This is seen by things helpful and hurtful.

Then secondly, we may suspect, that when the serous foulness doth by degrees creep forward with the nervous Juice, and at length penetrated deeply, that it doth contaminate these pure marrows, and greatly stuff up its Pores, so that the Animal Spirits do not shine or beam forth with a clear and full light, but with a weak, broken, and as it were with many shadows mingled or interspersed with it.

In an habitual Vertigo, and inveterate, it seems to be plain, that the Conjunct Cause doth contain both these, from the proof, and that not light, taken from things that are hurtful and helpful: For I have observed in many, that this affection or Distemper hath been altered, much for the worse or for the better, upon two occasions; for whatsoever things being inwardly taken, that beget turgid particles, and apt to grow too hot and rageing, as Wine, Strong-waters, spiced, pepper'd, and flatulous or windy food, always hurt those troubled with the Vertigo: and for the same occasions, no less hurtful are those things, by which the brain is filled, and more stuffed, as Surfeits, sleeping at Noon, or overlong in the Morning, the Southern wind, a cloudy, thick, and moist air, a low and watry habitation; on the contrary, the same persons are much helped, as they easily perceive, by a slender and light dyet, also by a clear air, and an open soil, where the wind has a thorow passage.

The more remote foregoing cause of the Vertigo consists both in the vice of the Blood, and of the Brain.

The Reason of the former explained.

Thus much concerning the subject, the formal reason, and the conjunct cause of the Vertigo; now in the next place, let us inquire into its Procatartick, or more remote leading cause; by reason of whose morbid provision or predisposition, these two evils are wont to be induced on the spirits inhabiting the middle part of the Brain: But here we apprehend both the Brain it self, with the watering Liquor, and also the Blood with its infected humors to be in fault.

The vice of this is most often, that it turns from its right temper, into a sour, acid, and otherways vicious disposition, and being degenerate, perverts the nourishing Juice; and also gathers in its bosom a Serum, and filthiness of diverse kinds, which it is ready to pour forth into the Head. But there are many evident causes, to wit, an evil dyet, and errors in the non-naturals, also the Scurvy, a long or malignant Feavour, and other Diseases going before, by reason of which the Blood becomes so full of ill humors, and so hurtful to the Head.

The vices of the Brain noted.

In the mean time, the crime of the Brain is, for that its temper is humid and weak, its frame loose and infirm, with its Pores too much open and gapeing, more than they ought, so that all the heterogeneous, strange, and elastick Particles, together with the serous, or otherways diseased recrements, being poured forth from the Blood into the Head, are easily admitted into the Brain, together with the nervous Juice; and because of its more open Pores, fall down without any let or stop into the middle part, viz. the Callous and streaked Bodies. This kind of too dissolute or loose habit of the brain, is in some innate and originally; further, those who are of a tender constitution, to wit, delicate, soft, and luxurious Men and Women, whose spirits are not able to suffer any thing strongly, easily contract a Vertiginous Distemper, or rather increase it; to wit, because when the spirits of the Brain cannot resist the incursions of strangers, they give way to every matter that is drove to them: but in others, though strong, inordinate feeding, a sedentary life, frequent surfeiting, also intemperate sleep, and study, an inveterate Scurvey, evil gross humors, a long Feavour, and other diseases of the Head, do very often cause this kind of evil disposition of the Brain.

The differences of this Disease.

From what hath been said, the differences of this Disease are easily gathered; for that I may pass by what we but now mentioned, that it was either a primary Distemper

temper of it self, or secondary arising or depending upon others: further we noted, that the primary *Vertigo*, so it were light and not deeply rooted, was only troublesome with fits excited from an evident cause; so that oftentimes the distemper'd are well enough, but by reason of their evil manner of living, or other accidents they become *Vertiginous*; but sometimes this Distemper becoming habitual, they are found to be obnoxious to it almost at all times. Secondly, As to the seat of this Disease there is a notable difference; for this is sometimes more outward as is seen happening in the Callous body, and hath almost only the tumults and failings of the Spirits, and the wandering, inconstant, and often confused acts of notions and sense, in the forepart of the Head; but sometimes the Morbific matter falling down more backward, about the streaked bodies, stirs up the *Scotomy*, or turning of the Head, and a loss or failing of the motive function, that oftentimes the Eyes are darkened, and they reel or stumble, and their Legs fail them.

As to the *prognostick* of this Disease, the *symptomack* or accidental *Vertigo*, yea almost all the others, while fresh, are free from much danger, and are easily to be Cured. *Its Prognostick;*

But the habitual, and almost continual, although great danger and suddenly to fall is rarely threatned; yet because it admits of only a difficult and long Cure, it so tires out both the Patient and the Physician, that before the Disease can be Cured, they both become weary of one another.

The primary *Vertigo* being placed before, or more outward, which hath scarce a darkness or falling accompanying it, is more safe, and healable, but is often changed into an inveterate Headach, and sometimes also it is cured of it self, by an *Hæmorrhage*, or bleeding at the nose, or by a flowing down of the *Hæmorrhoids*; it is also oftentimes taken away by Medicine.

The *Vertiginous* Distemper, arising behind, and intercepting the beamings forth of the Spirits into the Nerves, is far more dangerous, and oftentimes passes into an *Apoplexy*, or a *Palsie*, or into Convulsive Diseases.

There does not properly belong to the *symptomack Vertigo* any Curatory Method. *The Cure of the Vertigo.* There it is only needful to joyn some *Cephalick* Remedies, discussing the clouds of the Brain, and quieting the disorders of the Spirits, to those other primary indications; or rather that we may speak to the capacity of the vulgar (which ought to be done sometimes, though feignedly) let some Medicines contrary to Vapors be added.

The accidental *Vertigo*, or any other fresh or newly taken, may be healed with *Phlebotomy*, and a gentle Purge, and sometimes iterated: but that the Disease may be more certainly extirpated, let there be besides administer'd carefully *Cephalick* Remedies, such as are anon described.

For the Cure of an habitual *Vertigo*, and become inveterate, there ought to be instituted almost the like method, as is against most other *Cephalick* Diseases, which suggests these three chief intentions of healing, *viz.* in the first place must be endeavour'd that the root or nest of the Disease may be cut off, and that the brain may remain free from any new flowings in of the Morbific matter; for which end a right order of dyet being commanded, sometimes letting of blood, and most often a gentle Purge in the intervals are convenient. Let a dry and open air be chosen, let immoderate and untimely sleep and study be shunned, let morning and evening draughts be wholly abstained from; in the place of the former, let a draught of *Tea* or *Coffee*, with Sage leaves boiled in it, be given. Let an Issue be made in the Leg or Arm, and sometimes let the *Hæmorrhoidal* Vessels be kept open with Leeches; let the distemper'd rise early in the morning, and wash every day the fore-part of his Head with water, and also his Temples, and rub them with a course cloth. *There are three chief intentions of healing;*

Secondly, The second curatory intention is, to take away the *Procatartick* or more remote foregoing causes; wherefore, endeavour that both the *Dyscrasie* or evil disposition of the Blood may be removed, and also that the weak and too loose constitution of the Brain may be mended: For the former, altering remedies chiefly are convenient, as temperate *Antiscorbuticks*, and sometimes *Spaw Waters*, or *Whey*. To which always may be added for the latter indication, *Cephalick* Medicines, to wit, such as are prepared of Coral, Amber, humane Skull, the root of the male *Peony*, Mistleto, the dung of a Peacock, and the like, the forms of which we shall shew you by and by. *1. To take away the root or feeding of the Disease.*

The third Intention, which is properly curatory, endeavours to take away the *Conjunct Cause* of this Disease; which however the *Procatartick* Causes being removed, for the most part ceases of it self: for if the coming of every extraneous Matter into the Brain be cut off, there will remain nothing but pure and clear Spirits, and they having gotten open and free spaces, within the Callous Body, will from thence *2. To remove the procatartick causes.*

3. To take away the Conjunct Cause

thence flow forth on every side: However, for the scope of healing this, you must prosecute it with the former; with Medicines indued with a volatile salt, whose particles being very subtil and active, do refresh the Animal Spirits, of which sort are chiefly Spirits of Harts-Horn, Sut., of *Sal Armoniack*, &c. impregnated with Amber, and humane Skull, Tinctures of Coral, Amber, Antimony, Elixir of *Pæony*, &c.

The Curatory
Method is
shewn.

These things being premised, concerning the *Vertigo* in general, it will seem to the purpose, to draw or shadow forth the Curatory Method particularly, and as it were to direct you by a thread: and in the first place is shewn what is to be done for the Cure in the fit, and what out of it, for prevention.

1. As to the first, although the invasion of the *Vertigo* seem cruel, it is for the most part without danger, and easily passes over of its own accord; In such a case, if the Pulse shews it, let Phlebotomy be made use of, after having given a Glyster; but because the sick think themselves dying, and expect medicinal help, in that case let there be Blisters made in the Neck, and stinking things held to the Nose, as *Castor*, the Spirits or Salt of Harts-horn, or Urine, or of *Sal Armoniack*. Further, let these Spirits be given twice or thrice a day with a convenient Dose of *Cephalick Julep*: going to sleep, let them take a *Bolus* of *Mithridate*, with the Powder of *Castor*: let them take the next day, if the Distemper doth not yet vanish, a light Purge, or if the sick be prone or easie to Vomit, an *Emetick*, than which a better Remedy can scarce be taken.

Take Pills of Amber twenty five grains, of the Resine of Jalap six grains, of Tartar Vitriolated seven grains, of the Balsom of Peru what will suffice to make four Pills, to be taken going to bed, or early in the morning.

Or Take of the Sulphur of Antimony five grains, of the Cream of Tartar half a scruple, of Castor seven grains; make a Powder: Let it be taken with care, expecting to Vomit.

Why vomiting
Medicines are
so much noted in
this, and other
Diseases of the
Head.

That Vomiting Medicines do oftenest help in the *Vertigo*, besides the testimony of Authors, appears plain enough also from common observation; and besides, since those troubled with the *Vertigo* do often Vomit of their own accord, many have been of the opinion, that the cause of this Disease most commonly lyes hid in the stomach; but it is much otherways, and as we have elsewhere shewed; Vomiting frequently follows upon the Spirits being disturbed in the Brain: But that Vomits help much in this Disease, the reason is, because this kind of Physick causes a great revulsion of the humors from the Brain, and very much restrains the Spirits tumultuating in it. When the Membranes and Fibres of the Ventricle, and Viscera planted nigh them, are pulled; various humors, viz. the nervous, serous, watery, pancreatick, and cholerick are drawn into those parts, and so squeezed forth, so that the Head being freed from their flowing to it, doth easily shake off from it many impacted there before: then as to the Animal Spirits, we have shewed somewhere, that there is a most intimate commerce, and agreement between those inhabiting the stomach, and those dwelling in the Brain; to wit, that therefore the grateful or ingrateful affection of the Ventricle, from things taken into it, might bring rejoycing or dejection to the Spirits dwelling in the Brain. Opiates whilst they lye in the stomach cause sleep; in like manner, it doth not a little help in the *Vertigo*, and other *Cephalick* Diseases, whereby the Spirits of the Brain wandring up and down, and agitated enormously may be repressed, and returned into order; if their Companions or Kindred be stricken down, by the working of the Medicine; because whilst many are called forth from the Brain, to their assistance; the others remaining, remitting their disorders, resume their wonted offices or functions; without doubt it is for this reason chiefly, *Emeticks* bring so often help in the Distemper of madness, so that *Empericks* do almost only use them.

What is to be
done out of the
Fit, for preven-
tion sake.

2. But to return from our digression, let us consider what is to be done for the Curing of an inveterate and almost continual *Vertigo*, out of the fit. Therefore, first a method being instituted concerning bleeding, and purging, according to the constitution and strength of the Patient, and after rest, to be repeated; let a Vomit also, by my advice, be taken once a month (if nothing to the contrary hinders it) for which end let there be given to the weaker, after the stomach is filled with slippery Meats, Wine, and *Oxymel* of Squils, to about two or three ounces, and after it let a great quantity of Posset-drink be drunk, with *Carduus* boiled in it, that the Patient may vomit of himself, or by provocation. To others may be given an *Emetick* of the Salt of *Vitriol*, or the Sulphur of *Antimony*, or of the infusion of *Crocus Metal-lorum*:

lorum, as concerning Issues, Blisterings, the bleeding at the Hemorrhoidal Veins, Plaisters, or quilted Caps to be worn upon the Head, or other Topicks to be applied to the soles of the Feet, or to the wrists, for revulsion or derivation sake, let the Physician deliberate.

Take of the Conserve of the Flowers of *abeurata* Peony six ounces, of the Powder of its Root one ounce, of the Seeds of Peony powder'd two drams, of Amber, Coral, Pearls powder'd, of each two drams and a half, of the Salt of Coral one dram, of the Syrup of Coral, what will suffice to make an Electuary: the Dose is one dram and an half, or two drams, Evening and Mornings, drinking after it of the following distilled water three ounces.

Take of the fresh leaves of *Mistletoe* six handfuls, of the root of the male Peony, and of *Angelico*, each one pound and an half; of the whitest dung of the Peacock two pound, of Cardamoms bruised two ounces, of Castor three drams, all being cut small and mixt together, pour on them eight pints either of White Wine, or Whey, made of it: Let them be distilled in six Stills, and the whole liquor mixed together.

Take of the Powder of the Root of the male Peony half an ounce, of red Conab prepared, of Species *Digmbra*, each one dram and a half; of the Powder of the Flowers of the male Peony fresh bruised and dried in the Sun, one dram: make a Powder, to which add of the whitest Sugar, dissolved in the water of Peony, and boiled to the consistence of Tablets ten ounces: of this make Lozenges according to art, each weighing half a dram; eat one or two of them often in a day.

Because all things are not convenient to all Men, and that the Physician ought to try diverse Medicines, and institute various methods, and to try now this, now that, therefore we shall here add some other forms of another kind.

Take of our Syrup of Steel six ounces, and drink a spoonful of it in the Morning, and as five in the Evening, with the distilled water, but now described, or any other Cephalick, to the quantity of three ounces; or take of our Tincture of Steel, from fifteen to twenty drops, in a draught of the same distilled water, twice in a day. I have known this to have given notable help to many.

Let there be given daily after the same manner, Doses, sometimes of the Spirit of *Surt*, *Harts-horn*, or of *Sal Armaniack*, impregnated with Coral, Amber, or the Skull of a Man: or of the Tincture of Antimony, Amber or Coral.

Take of the Powder of the Root of the male Peony one ounce and an half, of the Seeds of Peony, Coral prepared, and of the whitest Amber, each three drams; of Pearls prepared, of the Powder of the Flowers of the male Peony, fresh bruised and dried in the Sun, of each two drams; of Sugar-Candy one ounce: make a Powder, and take one dram twice in a day with a draught of Tea or Coffee, or a Decoction of Sage or Rosemary.

For poor people may be prescribed Powder of the leaves of the Apple-tree, *Mistletoe*, dried in the Sun, and powder'd, to the quantity of a dram, to be taken twice in a day. Or take of the whitest Peacock's dung six ounces, of the Powder of the Flowers of the male Peony one ounce, of Sugar two ounces; make a Powder, of which let them take a spoonful twice in a day, in some convenient liquor.

Let those troubled with the Vertigo drink for their ordinary drink, small Ale, with leaves of the Orchard *Mistletoe* boiled in it instead of Hops, and in the Vessel holding about four gallons, let a little bag be hanged, in which put half a pint of Peacock's dung, and three drams of Cloves bruised.

Examples of those labouring with the Vertigo are so frequently met withal and almost daily, that there seems no need to add here any; but however, that the image or type of this Disease may be known, I shall only mention some few and more rare cases.

A Divine about sixty years of age, after he had been troubled for about three months with a light Vertigo, or as it were a frequent confusion or brandishing of the Spirits, in the fore part of the Head, at length the Disease growing worse, he became ready to fall, and with a darkness before his eyes; in so much, that in walking he sometimes would fall flat on the ground. Being sent for to Cure him, I prescribed Phlebotomy, with a gentle Purge, and after a little respite, to be repeated again; further, I took care to have the Electuary, and mixtures given him, such as we noted above, with Blistering Plaisters, and other administrations not to be neglected. A fortnight after, no ease following from these, I gave him a Vomit of the Salt of *Vitriol*, and the infusion of *Crocus Metallorum*, by which when he had easily vomited ten times, he began to find himself better, and by using further altering Cephalicks, for

Cases and Examples of the Sick.

The first History.

about

about a fortnight more, he became perfectly well, and from that time, for six years, he took yearly Spring and fall a Vomit, with some other Medicines; though he continued in perfect health.

The second History.

A certain Gentleman about sixty six years of Age, when he had lived for a long time obnoxious to a light *Vertigo*, and that was wont to be excited only occasionally, about the end of the last *Autumn*, labouring more grievously with this Distemper, he also became forgetful. Being sent for to visit this Man, after he had been sick about three weeks, I found him very much changed in his looks and countenance, the vigor of both being diminished. Seeing that he was daily distemper'd towards evening with a small Feavour, his Pulse beating high and vehemently: I first caused blood to be taken out of his Arm, and after six or seven days, out of the *Hæmorrhoidal Veins*, and then I took care for Blisters to be made behind the Ears and hind part of the Neck, and two large Issues between the shoulders. Inwardly, at physical hours, he took daily *Cephalick* Medicines, almost of every kind. Within a months space he seem'd to recover, and began to walk abroad, and to take care of his household affairs, and other businesses: but in the beginning of the Winter, taking cold by going daily abroad, he fell into a little Feavour, with a greater perturbation of the spirits within his Head: for becoming every evening delirious, he hardly knew what he said or did. But within seven or eight days, blood being taken away, and a slender dyet used, the Feavour vanished, but the distemper of the Brain was changed from its former state. For the *Vertigo* wholly ceasing, he became very forgetful, and *Paralytick*, in all his right side. As to his Head, being asked, whether it was clear, and free from the dizziness and confused Phantasms; he answered, that as to those things, he never was better in his life: For he well understood his infirmity, knew his Friends and Relations, and others who came to visit him, but could hardly remember the names of any of them; and when he began to talk of any thing, he wanted words to express his mind: Then as to his Distemper in his side, in his right Arm and Leg; there was not only a loosning wholly, and a want of motion; but in either there grew a great white waterish Tumor, in so much that not only the Cure, but his life was despaired of, to be long prolonged; yea, the Magistracy and Offices which he held, were sought for by others.

However I did not desist from my curatory work, the most skilful Physician Doctor *Wharton* being called to my assistance. Carefully administering to the sick by our joint counsels, we prescribed solutive Pills to be taken at times, and in Medicinal hours on other days *Cephalick*, *Antiscorbutick*, and *Antiparalytick* Remedies: His head being shaven, we ordered a Plaster of Gumms and Balsoms to be laid upon it, and the loosened parts to be anointed with Oyls and Balsoms, and to be strongly rubbed. Whilst these things were doing, with some success as to the greater clearness of his intellect, I know not from what cause, he fell into a Feavour, in the midst of the Winter, so that for several days and nights, he grew extremely hot, with burning, great thirst, and interrupted sleep; his tongue being scorch'd, and having a white scurf, his Pulse was high, his Urine red, and full of contents. We abstained from *Phlebotomy*, by reason of his Age and *Palsie*, and especially because of the Dropsie begun in the distemper'd side: but with a slender dyet prepared of Barly Broths, and Grewel, we order'd him day by day *Juleps*, *Apozems*, and other Remedies moving Sweat and Urine; and when about this time the Issues between his shoulders flow'd very much, the sick man began to grow better as to his Memory, and *Palsie*, and from thence profiting daily, and by degrees growing well, of both his distempers, together with his Feavour, he was restored to perfect health within a fortnight, and is still living in health.

The Reason of the Case described.

In this sick man there was a notable motion, and a various change or translation of the Morbifick matter; for what was at first in the middle part of the Brain, viz. sitting on the Callous Body, stirred up the cruel *Vertigo*; the same afterwards increased, and (as it is probable) being further diffused into the infoldings of the Brain, brought forgetfulness or oblivion to the former Distemper: Then forasmuch as the same matter being moved by the Feavour, and a little discussed, falling partly on one of the streaked bodies, brought the *Palsie* of one side, and being partly expulsd into the compass of the Brain, almost took away the Memory, the *Callous* Body in the mean time obtaining a clearness; and lastly, it was not without the help of the other Feavour, that the Morbifick matter being discussed from these two last nests, was wholly carried away, the sick being restored to health.

The third History.

Lately being tired out with the continual complaints of a certain man, troubled with the *Vertigo*, after many other Remedies tried in vain, I prescribed at length, that for the space of a month, he should take daily, twice a day, about a spoonful of the

the following Powder, drinking after it a draught of the Decoction of Sage or Rosemary, impregnated with the Tincture of Coffee.

Take of the Powder of the Roots of the male *Pæony* two ounces, of the Flowers of the same bruised and dried in the Sun one ounce, of the whitest dung of the Peacock half a pound, of white Sugar two ounces; make a Powder.

It is scarce credible how much help he received from this Remedy; visiting me after a month, he seem'd a new and another man; being freed of the *Vertigo*, he not only confidently walked about, but was able to take care of his household affairs, and to meddle with any hard business, which he was not able to do before.

C H A P. VIII.

Of the Apoplexy.

AS the seat of the *Vertigo*, so also of the *Apoplexy*, seems to be within the same more inward cloyster of the Brain, viz. the *Callous Body*; to wit, because in either Distemper, although in a far different degree, the imagination and the common sense are affected, viz. in the first, the irradiation of the Spirits is wont to be obscured in some places, and as it were broken with interspersed shades; but in the latter, the same is wholly darkened, and suffers a full eclipse. The Seat of the Apoplexy.

The word *Apoplexy* denotes percussio, and by reason of the stupendous nature of the Disease, containing as it were something divine, it is called a *Sideration* or *Blasting*; for those taken with it, being as it were Planet struck, or with an invisible *Nu-men*, fall suddenly to the ground, and being deprived of sense and motion, and the whole animal function ceasing (unless that they breathe) they lye a long time as if dead, and sometimes yield to death; But if they revive, oftentimes they are taken with an universal Palsie, or else of one side. A Description of the Disease.

The immediate subject of the *Apoplexy*, and the nearest, are the Animal Spirits inhabiting that region of the Brain where the principle faculties of the knowing or understanding soul reside; to wit, the *Callous Body*: but we conclude the mediate subject, to be the middle part of the Brain; because from hence, the instincts of all spontaneous motions proceed, and in this, the perceptions of all sensible things are terminated: by what means the *Cerebel* and *Præcordia*, and all the other parts both Animal and Vital, are secundarily affected, we shall shew anon, when the symptoms of this Disease and their reasons are delivered. Upon the coming of the *Apoplectick* fit, all the acts of every spontaneous and knowing function (to wit, which depend upon the brain it self) are forthwith hindered and cease; the reason of which is, because the Animal Spirits being suppressed in their chief place of meeting, to wit, the *Callous Body*, both their next motion of expansion in that place, as also their flowing forth into the nervous appendix, is wholly defective: For therefore, by reason of such an eclipse of them in that place, an immediate and an universal darkness is caused in the whole animal region, which is under this government: yet in the mean time, the Pulse and respiration, as also the motion of the Ventricle and Intestines, are after a sort performed, either perfectly and freely, or at least interruptedly and with pain; forasmuch as their actions proceed wholly from the *Cerebel*, which is not at all, or but little hurt by the Mörbifick matter. Its Subject.

But it will seem difficult to be explained, after what manner, and from what causes, the Animal Spirits are so suddenly, and all at once suppressed, and as it were extinguished, about their first spring of emanation; so that all sense and motion depending thereon ceases every where. Concerning this, there are many and diverse opinions of Authors; whilst some place the cause of the *Apoplexy* in the Heart, and others in the Brain; then some lay the fault on the intemperance of that, and others on the evil conformation of this. Further, the obstruction of the Brain is said by some to cause the *Apoplexy* in the greater Ventricles, by others in its Pores or lesser passages: then the obstruction being taken for the cause of the Disease, and wholly binding up the lesser Pores of the Brain, is said to excite the fit, either because the afflux of the blood, for the begetting of Spirits is hindered from those parts; or because The spontaneous Functions only deficient in the Apoplexy.

cause, the flowing forth or emanation from thence, of the Animal spirits is kept back. It would be a tedious thing to examine the opinions of every one, and to consider the weight of their reasons.

The Theory of this Disease is best shewn by the famous Dr. Webber.

The Theory of this Disease seems to be very exactly delivered by the famous *Webber*; for in the first place, for the finding out of its so abstruse and hidden causes, he brings Histories or *Anatomical* observations, in which the *Phanomena* are declared in many dead Carcases of those dying of this Disease; to wit, in three struck or blasted, he had found the blood extravasated or out of the Vessels here and there in great clodders, and had largely marked the substance of the Brain; in another the Serous Colluvies had overflowed the whole head, both without and within the Skull. From these footsteps of this most hidden Disease thus detected, the Author concludes, "That the principal places affected are not the greater Ventricles, but the middle marrowy substance of the Brain and Cerebel, which is every where porous, and indued with very small passages, both that the vital spirits may flow in thither from the blood, and that the animal may flow forth: But indeed he affirms, That the whole cause of every *Apoplexy* doth consist in these two, viz. either in one of them, or both of them together: to wit, either because the flowing of the blood thorow the Arteries to the Brain is deny'd, or else by reason that the flowing forth of the Animal Spirit from the Brain and Cerebel, thorow the Nerves and Spinal Marrow, is prohibited; or for both these causes together. As to the former, he proposes a threefold means, whereby the blood may be hindred; viz. First, Either by reason of the obstruction of the inner *Carotid* Arteries, and of the *Vertebrals*, to wit, which happens in the greater Vessels, and chiefly about the ascent of the Brain, from the blood concentered into clodderly pieces; or in the lesser Vessels, which pass thorow the brain from a Viscous Matter planted in them: Or, Secondly, the flowing in of the blood is detained from the brain, by reason of the compression of those Vessels, which sometimes happens, because the *Paristhmia*, or Kernels of the hinder part of the Neck, do so swell up, from a Serous heap of watry Humors, that by pressing together the Arteries passing thorow, shuts forth the passage of blood to the Head. Or, Thirdly, The bloody flood may be hindred, because a Vessel being preternaturally opened within the Skull, great quantity of blood is poured forth, which should otherways go to the benefit of the brain. As to the other cause of the astonishing Disease, viz. from the flowing forth of the Spirits being hindred, he affirms that may be caused by two ways; to wit, either by reason of the obstruction of the beginning of all the Nerves, caused by a serous inundation, or by a sudden compression of the same; which is caused either by an heaping up of too much blood in the *Meninges*, or in some parts of the brain it self, or in its Ventricles; or else by a disposition of the *Phlegmonodes*.

Another Reason given by the Author.

These most ingenious reasons indeed seem to challenge our assent, for that more probable or more likely are not easily to be brought; but because we think some of these are to be altered, and others to be added, therefore we shall here institute, though not a different, yet somewhat another reason of this Disease.

The Exclusion of the Blood from the Brain does not easily happen;

And in the first place, though we grant that the flowing in of the blood, may be sometimes denyed to the Brain; yet we do not believe, that it only happens after the aforesaid ways, nor that, for that reason, the *Apoplexy* doth arise. We have elsewhere shewed, that the *Cephalick* Arteries, viz. the *Carotides*, and the *Vertebrals*, do so communicate one with another, and all of them in several places, are so ingrafted one in another mutually, that if it happen, that many of them should be stopped or pressed together at once; yet the blood being admitted to the Head, by the passage of one Artery only, either the *Carotid* or the *Vertebral*, it would presently pass thorow all those parts both exterior and interior: which indeed we have sufficiently proved by an experiment, for that Ink being squirted in the trunk of one Vessel, quickly filled all the sanguiferous passages, and every where stained the Brain it self. I once opened the dead carcase of one wasted away, in which the right Arteries, both the *Carotid* and the *Vertebral*, within the Skull, were become bony and impervious, and did shut forth the blood from that side, notwithstanding the sick person was not troubled with the astonishing Disease; wherefore, it may be doubted, whether the blood excluded from the Brain, by reason of some Arteries being obstructed or compressed, doth bring forth this Disease. Certainly there is more of danger, that the cause of the *Apoplexy*, should be from its too great incursion and extravasation within the Brain, as it was in the three *Apoplectick* people, cited by the Author; and that not only, because the marrowy substance of the Brain was deprived of the Blood coming to its use, (for such a defect might have been supplied by the other Vessels, extending their branches every where) but rather, because by the extravasated Blood, and not

Because all the Arteries communicate one with another, and some of them supply the defects of the others.

not seldom being concreted into an hard and mighty bulk, the marrow of the Brain is pressed together, the passages of the Spirits being by that means shut up.

But indeed, though we deny this to the afflux of the blood into the Brain, being hindred in any part only, yet it may be granted to its total exclusion, for therefore we have often noted, a want of all motion to be caused: which Distemper however hath been rarely taken for the astonishing disease, but rather is wont to be called a *Syncopy*, or Swooning away, or the *Hysterical* Passion: If at any time the motion of the Heart be wholly suppressed, presently, the Blood being retained without the Brain, the Animal Spirits fall down, even as the light vanishes when the flame is put out.

A total Exclusion of the blood from the Brain sometimes happening, causes a terrible Syncopy.

The action of the Heart is stopped or hindred, either by reason of the improporionate flowing in of the Blood, as in the violent passions of fear or sadness, or by reason of the Animal Spirits, which serve for its motion, being denied by the Cerebel. This we think to happen sometimes, because of the *Cardiack* Nerves being Distemper'd with a Convulsion, or otherways bound together, after which manner it is usual in Convulsive and *Hysterical* Passions; sometimes for the outward parts, as the Arms and Legs, and sometimes the Inward, to wit, the *Præcordia* and *Viscera*, one after another to be affected: but a want of motion follows the inordinations of these, in which the sick lie for some time without motion or sense, with a small or seldom beating Pulse as if dead. Which indeed so seems to come to pass, by reason of the *Cardiack* Nerves being contracted at that time, and so the Spirits which were about to flow being suspended; though we believe such a want of motion sometimes to be produced by the mere confusion of the Spirits within the Brain, but in this case, the heart it self is lively enough moved, and the Pulse is also strong and laudable.

This depends oftentimes on the motion of the heart, being hindred, and so either because of the *Cardiack* Nerves being bound together;

But besides, it seems most likely, that the motion of the Heart is often suppressed or inhibited, by reason of the Animal Spirits, destinated to the vital function, being suppressed in the fountain it self; to wit, within the Cerebel. We have mentioned this to be done in the Distemper of the *Incubus*: but without doubt it ought to be attributed to this cause, for that I have observed in some, a failing of the Spirits, with a sudden privation of all the Animal functions to follow, upon a great weight in the hinder-part of the Head, in which the sick become senseless and immoveable, with the Pulse and breathing very much lessened, and scarce perceivable, and lye quite cold for many hours; yea oftentimes, a day or two, more like dead than living persons. I have known sometimes those distemper'd, to be stiff and cold, Pulse and breathing to be thought quite gone, and to be indeed esteemed quite dead, and put into their Coffin, yet after two or three days to have reviv'd again: but whoever awakes out of this fit, whether it be of short or long continuance, does not for that reason fall into a Palsie, or half Palsie of one side, as those for the most part do, who are distemper'd with the *Apoplexy*. Further, no doubt but that many die from such a Morbific cause, whose death wrongfully hath been ascribed, either to the mortal *Syncopy*, or to the *Apoplexy* properly so called. Truly the case afterwards described, can only have the like reason given for it. Wherefore, though it may seem a *Paradox*, yet it is not incongruous to reason, that we affirm, that there is a twofold *Apoplexy*, one in the *Cerebel*, which we but now described; the other seated in the middle of the Brain, into the causes of which, and the manner of it, we shall now inquire.

Or, By reason of the Spirits in the Cerebel, being hindred from their flowing into the Nerves.

Hence there is a twofold *Apoplexy*, one in the Brain, the other proper to the Cerebel.

But here in the first place we must distinguish concerning the various assault or fit of this Disease, to wit, forasmuch as sometimes being excited, without any previous disposition, or *Procatarxis*, from a sudden and solitary cause, it is often invincible, and for the most part mortal; against this there can be no preventive method of healing, or preservatories instituted; and the Curatory method which is wont to be taken, proves very oft ineffectual. Or, Secondly, the *Apoplethick* fit having an antecedent cause, or previous *Procatarxis*, is brought into act by reason of various occasions, or evident causes.

The Theory of the former delivered. This Disease either accidental, or habitual.

As to what belongs to the blasting, or being stricken, of the former kind, to wit, suddenly and unthought of, its conjunct or next cause is, either a great solution or breach of the unity, happening some where within or near the middle of the Brain, by reason of which its Pores and passages being obstructed or pressed together, the whole emanation of the Spirits is suppressed: or else it is an huge and sudden profligation of the Spirits, or an extinction of those dwelling in the Brain. We shall shew the formal reasons of both of them particularly, and the several ways of their being affected.

The cause of the former is, either a great breach of the unity in or near the middle of the Brain;

Or a sudden suspension or extinction of the Spirits.

Extravasated Blood, the breaking of an Imposthum, and a great flood of Serous humor plentifully flowing forth, are wont to effect the greater breach of the unity within the Brain.

1. A Solution of: From Blood effused or extravasated within the Brain, and there either growing together in clodders, or striking on the affected places, doth often times cause mortal Apoplectick fits; as I my self have proved by Anatomical inspection in some others, besides the instances brought by the famous Webber; but such Morbific extravasations of the Blood within the Brain, proceed either from an external cause, as a fall from on high, or by a blow on the Head, or by hitting it against some hard thing, and the like; or from an inward cause, to wit, for that the Blood being sharp and thin, and the little mouths of the Vessels, and the places between being too loose, it growing more than ordinarily hot, either of its own accord or occasionally, and flowing forth thorow these, easily breaks into the soft and yielding substance of the Brain. Further, although we have assigned the seat of this Disease in the *Callosa* Body, yet the blood, because effused somewhere nigh or above it; because it compresses the underlying Marrow, by intumescing the distemper'd places, causes the Apoplectick fit.

2. From an Imposthume, or the breaking of an Ulcer; Or, Secondly, An Imposthume or Ulcer is rarely wont to be excited within the Brain, but often in the *Meninges*, and almost for the same occasions, by which the extravasation of the blood happens: while it is ripening, it causes only an Headach or heaviness; but when it is broke, the filthy stuff flowing from it, into the shelly part of the Brain, gnaws and putrefies it, and then by degrees instilling its putrid particles, and very infectious to the Spirits, into the middle or marrowie part of the Brain, raises up at last the fit of the astonishing disease.

3. From a Deluge of the Serous. Thirdly, The Serous heap or deluge being poured forth from the blood, into the Head, though rarely or never of it self, yet sometimes by reason of more strong evident causes, runs so suddenly into the Brain, that filling and stuffing soon all its Marrowie Pores, causes astonishment or deprivation of sense and motion: And this I have known to happen to some, from drinking of sharp thin Wine, or *Span*-waters, and sleeping upon it; and I have observed the like effect, from a long and total suppression of Urine, also in *Hæmorrhages* (or fluxes of blood) being suddenly stopped: And lastly, the Serous Recrements in malignant Feavours, being translated to the Head, by a critical transposition, often causes a mortal senselessness, or becoming speechless.

An extinction of the Spirits from Opiates, or from immoderate Drinking of hot Waters. Another kind of evident causes, from which sudden blasting or being smitten is wont to be caused, consists in the sudden profligation or extinction of the Spirits, which indeed doth not seldom or rarely happen, from strong *Narcoticks*, or Medicines causing sleep, and also from the immoderate drinking of hot waters.

The operation of Opiates, as it is assigned by the famous Webber. Though we have already discoursed concerning the use and effects of *Opiates*, I cannot however pass over their way of affecting, assigned by that most famous Doctor Webber. This Learned Man affirms, That *Narcoticks* only do too much open and dilate the Pores and passages of the Brain, and as it were open the doors of it, before fast shut, whereby every extraneous and incongruous thing is admitted into the Chamber or sleeping place of the Spirits; together with the subtil liquor poured forth from the blood; and so by a violent incursion, dissipates their ranks and orders. But indeed it appears from what hath been above said, that *Narcoticks* do not only or always operate so; for we have shewn that whilst they are yet within the Ventricle, they often cause sleep, and sometimes death it self: Besides, it should follow from thence, that *Opiates* being often given should bring still a greater evil, because by dilating more and more the Pores of the Brain, they cause a much more easie entrance to all manner of impurities; but truly it is clear enough, that *Narcoticks* are most hurtful at the first time being taken, and afterwards being often taken do little hurt; so that some accustomed to *Opium*, will devour a great quantity of it without hurt; which is certainly a sign, that this doth not so much alter the conformation of the Brain as that it doth immediately agitate or work upon the Animal Spirits; whom at first (because so very impropportionate to them) it slays with a mere blast; then afterwards there being a certain familiarity between them, and this Medicine, it disturbs them not.

The formal reason of the habitual Apoplexy. Thus much concerning the causes of the accidental and sudden Apoplexy, which falls indifferently upon all men, though not at all predisposed: for which also there can be no preventive Medicines instituted; and it is rarely that it is cured. But besides, we observe, that this Disease is sometimes habitual, and that it remains as a constant disposition in some men, by reason of which, at first they are exercised only with light skirmishes, but after some time they become more grievous, and of which at last for the most part they dye. Concerning this therefore, we shall inquire, 1. what the Conjunct Cause of this Disease may be, and the formal reason of it. 2. In what the Apoplectick Disposition or *Procatarxis* of the Disease consists: Then 3. What Evident Causes it hath. As

As to the first, we may suppose, upon the coming of the *Apoplectick* fit, that a certain matter before heaped up, and dispersed in the compass of the Brain, at length doth descend into its middle or marrowie part, and there doth assault all the Spirits, and suppress and beat them down in the very fountain of their emanation: Although it doth not plainly appear, whether they effect it either by stuffing only the Pores of the Marrow, or by driving away the Spirits themselves, or by inflicting on them a numbness; notwithstanding it is likely, that it may be done by either of the ways. And indeed we say the medullary Pores of the Brain, may be somewhat stopped or obstructed, because the same matter, which at first settling on the *Callous* Body, caused senselessness, being slid down from thence lower into the *Callous* Body, and then stuffing its Pores, is wont to excite the Palsie of one side. But yet we may not conclude, that the sideration or being struck, doth arise only from the Pores of the Brain being stopped, because then the fit would oftentimes creep on them gently, and by little and little; forasmuch as all the Pores cannot be possessed by the inflowing matter at once, but successively, and some after others. But when as this Distemper leaps upon one suddenly, and like lightning, what can we conceive less, than that the Spirits are struck down as it were by a blast, from the malignant contact of the matter rushing upon them? For it seems, that its particles descending on every side from the compass of the Brain, into its middle part or the *Callous* Body, and entering it from every part, do presently fill the passages how strait so ever they be, and drive to flight hither and thither the Spirits, and compel them into a close place, who being then beset and reduced to a strait corner, when they can neither resist long, or are able to penetrate into other Pores possessed by the Morbifick matter, at length are struck flat down, letting go every function of the knowing soul; but then they do not easily nor quickly rise up again, because they are not able to quit themselves from the embraces, or bonds of the malignant matter, nor pass any where into empty or open places; wherefore, they lie long suppressed, till at length sometimes perhaps that matter, though leisurely, is dissipated, or supped up into the Blood, or issuing forth from the little Pores of the Marrow, slides forward into the Ventricles of the Brain; or at length, that matter sliding a little lower, and being impacted on the Streaked Bodies, either one or both of them, causes the *Hemiplegia*, or half Palsie, or the Palsie: In the mean time, as the Spirits, within the *Callous* Body grow free, and getting wider spaces, they resume their wonted offices; which they indeed execute, until new matter springing again in the compass of the Brain, and being by degrees increased, descending into the *Callous* Body, brings on another fit; out of which, if the Spirits get not, by either of the aforesaid ways, being wholly discomfited, they perish by degrees.

It consists in the Pores of the callous Body, being suddenly stop'd, and the Spirits being driven away, by the contact of malignant matter.

If you should ask after the nature or disposition of this Morbifick matter; it may be suspected, that the Animal Spirits in the *Apoplexy* are plainly affected after another manner, than in Convulsive passions; to wit, those obnoxious to this blasting obtain a *Copula* contrary to the explosive, that is, *Vitriolick*, rather than *Nitro-sulphureous*; and so by it their spiritous-saline particles are wholly fixed, and are hindred from entering into any motions or explosions, even as when the *Vitriolick* particles being beaten and combined with the fulminating gold, they quite take away its explosive or letting off virtue, and congeal and render immoveable all other active particles, like the blowing of a freezing air. The Animal Spirits seem to be not unlike the same, and their *Copula*'s have divers sorts of adjuncts, some of which induce an *E-lastick* and very explosive virtue, as in the Convulsive Distempers, and others a stupor, numbness, or immobility, as in the sleepy Diseases, and also in the *Apoplexy* and *Palsie*.

What the nature or disposition of the morbifick matter is.

Thus much concerning the *Conjunct Cause*, and formal reason of the *Apoplexy*; as to its *Procatartick* or fore-leading Causes, they are much after the same manner as in most other *Cephalick* Distempers; to wit, both the Blood is in fault, for that it affords to the Head extraneous particles, and very contrary, or as it were destructive to the Texture or constitution of the Animal Spirits, either begotten in it self, or taken from some other place: and then the Brain is in fault, for that being weak in its disposition, and so its Pores and passages too dissolute and lax, so that it always and easily admits without impediment, the Morbifick matter poured forth from the Blood. There is no need that we should here rehearse or unfold particularly the peculiar reasons of either, and the various ways by which it is done; but we shall rather refer you to what we have already said very largely, concerning the foreleading causes of the inveterate Headach, and also of the *Lethargy*. Further, the like or the same evident causes, which were noted in those Distempers, and in other sleepy Diseases, ought here to be taken notice of, to be shunned carefully by *Apoplectick* people.

The procatartick Cause of the habitual Apoplexy.

From

The differences
of this Disease.

From what hath been said, the differences of this Disease may be easily known : 1. What we mentioned but now ; The *Apoplexy* is either accidental, which is suddenly, and at once excited, without any foregoing cause, and almost indifferently in all, from some strong evident cause ; or it is wont to be esteemed habitual, which depending upon a previous disposition, hath frequent fits, by reason of several occasions : 2. From the reason of the subject, this Disease is said to be proper, either to the Brain or Cerebel, or common to both : previous and frequent *Scotomies* or dizziness with mists before the eyes, and the Distemper of the *Vertigo*, denote the Brain more obnoxious to this Disease : A frequent Night-Mare, intermitting Pulse, often Swooning and failings of the Spirits, argue the *Cerebel* to be evilly disposed.

3. In respect of magnitude, it is either universal, every function, both merely natural and the spontaneous ceasing ; or it is partial, this or that part being affected by it self, then for that the faculties of either, now all, now many only, yet none excepted suffer an *eclipse* ; for in either regiment, the morbidic matter descending to the middle or marrowie part, possesses sometimes all its whole substance, sometimes part of it, to wit, the fore part, hinder, or middle part. 4. In respect of the antecedent cause, the *Apoplectical* disposition is either hereditary or innate, or acquired by means of an evil dyet, or other accidents.

Its Prognosticks

The *prognostick* or fore-judging of this Disease is always denounced deadly or dubious ; for the *Apoplexy* is never without present or future danger. But it is worst of all, in which, besides the abolition of all the spontaneous functions, the Pulse and breathing also are either deficient, or are performed laboriously ; and then for the most part it happens, with a foam at the mouth, and snorting ; upon which comes a sweat, which is often like melted grease, and indicates a very sudden death to be at hand.

Those who are blasted or stricken, and are presently deprived of Pulse and breathing, and a little after growing cold, and seem dead or without any life, are not presently to be had from bed, or left destitute of Medicinal helps : further, though there be no hopes of life, they ought not to be buried under three or four days ; because such do sometimes revive again, either of their own accord, or by the use of Remedies : which certainly comes to pass, not because a vital heat is at last stirred up in the heart (for it is not there extinguished altogether ;) but because the Morbidic matter being dissolved, or evaporated from the *Cerebel*, the motion of the heart is restored, like a Clock when the weights are put on.

In the *Apoplectical* fit, if any help follows upon letting of Blood, there is hope of health. But if after this and other Remedies, the Distemper continues without intermission, above the space of a night or a day, or grows worse, the case is desperate.

If after the first speechless fit being over, the sick person becomes more nummed and duller, and distemper'd with a *Scotomy*, and frequent *Vertigo*, it is a sign that he will be obnoxious to more fits of this astonishing Disease : for the aforesaid distempers proceed from the Morbidic matter, already laid up in the compass of the Brain, and there flowing sprinklingly, and thence descending thorow the very small Pores only, into the middle part : which matter whether *Vitriolick* or *Narcotick*, growing to a greater fulness, calls on this blasting or being suddenly smitten.

The Curatory
Method.

The *Therapeutick* Method, is either Curatory, for the taking away the fit, when it is upon one ; or preservative to prevent it, that it may not return : the former belongs to every *Apoplexy*, the other only to the habitual.

What is to be
done in the Fit.

The assault or fit of this Disease being come, (if it proceeds not from some outward or vehement hurt of the head) although it is not known, whether it be excited or no from an invincible cause, such as the Blood being let forth of the Vessels, or the breaking of an *Imposthum* in the Brain, yet we ought carefully to endeavour the Cure of it. And because the blood being too hot or swelling up, is wont sometimes to bring in the Morbidic cause, or at least to increase it, and the same sinking down, and becoming more settled, sometimes carries it away ; therefore in the first place, you ought to deliberate, concerning the moderating its course. And here a question arises, concerning the placing of the Patient, to wit, whether he ought presently to be put to bed, or to be detained out of it for some time : some religiously observe the latter, and that not without reason ; to wit, because in Bed there is a greater propensity to sleep, and the blood growing hot, and flaming forth more plentifully, by reason of the heat of the Bed-cloaths, pours forth still more recrementitious matter into the distemper'd Brain : on the contrary, whilst the sick is thinly clothed, and placed in a Chair, the blood flows more slowly, and the sinking Vessels seem more apt rather to sup back the humors out of the Head, than to send them thither.

In what position
the Sick ought
to be kept,

Wherefore,

Wherefore, if the Patient be strong enough, it will be expedient perhaps to let him stay out of bed for six or eight hours, till the flux of the Morbific Matter passes over, and the course of the Blood be made more quiet by *Phlebotomy*, and other Remedies carefully administered: but the weak, and who are of a tender constitution, let them be put to bed as soon as they are smitten. But let not the sick, whether in bed or up, lye upon his back, but with his head somewhat upright, and inclining either to one side or the other.

Phlebotomy, necessary almost in all *Apoplectical* persons, is not to be deferred: but the Blood is copiously drawn back by a strong *Clyster*. In the *Clyster* may be dissolved the Species of *Hiera Diacolyntia*, and a troubled Infusion of *Crocus Metallorum*. Let a large Blistering Plaster be applied to the hinder part of the Head, and other drawing *Cataplasms* to the Legs and Feet: Let the Temples and Nostrils be anointed with proper Oyls and Balsoms, and let painful rubbings be used almost to the whole Body: In the mean time, let things that stir up the Animal Spirits, and help them out of their bonds be given them; viz. Spirits of Harts-horn, Sut, and the like, with a *Cephalick Julep*. *Phlebotomy.*
Other ways of Administration noted.

After this the sick being placed in the bed (if he be able and doth easily Vomit) let an *Emerick* be given him, of the Salt of *Vitriol*, *Oxymel* of *Squills*, or an Infusion of *Crocus Metallorum*, and then with a Feather put down the throat, provoke vomiting four or five times, drinking between whiles *Posset-drink*. *Vomiting Medicines.*

Vomiting being over, let there be given Comforters, as the *Elixir Vite* of *Quercitan*, Spirits of *Lavender*, or *Camphorated Treacle*, *Tincture* of *Pæony*, or of *Amber*, or of *Coral*, with *Apoplectical* Water, or other appropriate Waters in a convenient Dose, and repeated as the business requires. *Comforters.*

On the second day, the same Remedies being still continued, let dry Cupping-Glasses, or with Scarification, be applied between the shoulders, or to the hinder part of the Neck; or if more blood ought to be taken away, let the jugular Vein be opened; the *Clyster* repeated; apply to the Nose Spirit of *Sal Armoniack*, or a fume of *Galbanum* boiled in strong Vinegar. Besides, let *Errhines* or Sneezing Powders, and things to chew in the mouth to draw away Rheum be used. Then in the Evening let a Purge be ordered of *Pil. Rudii*, or a Solutive Electuary of *Roses*, dissolved in some liquor. *Cupping-glasses.*

None of these things helping, though there be small or no hope, the top of the Head being shaven, let glowing Iron be held over it, or a large Blister made upon it; and let the other part, especially the Forehead, and forepart of the Head, be bathed with *Bezoardick* Vinegar; let Leeches be set to the Temples, or behind the Ears; let also a large Dose of Spirits of Harts-horn, or of Sut, be often poured down the throat; these and other the like administrations, are to be used till you see death at hand; which (as *Celsus* saith) these sort of Remedies only defer, but some times hasten life. *Hot or glowing Iron.*

The *Prophylactick* or preventive Method, respects both those who have been troubled with one or more fits, and also those who are seen to be prone to it, as those who are born of *Apoplectick* Parents, or are frequently obnoxious to the *Vertigo*, the *Incubus*, or Swooning away; also such who have short and brawny Necks. *The preservatory Method.*

Let Purging and Bleeding be ordered Spring and Fall, where it is convenient; as to the former, those who are easie to vomit, let them first take an *Emerick*, of the infusion of *Crocus Metallorum*, with the Salt of *Vitriol*, or of the Sulphur of *Antimony*; and then after three or four days, let there be given a Dose of *Pil. Rudii*, or of *Amber*; and after a due distance between, let it be repeated three or four times: Let two large Issues be made between the shoulders; or if that place doth not please some, let them be made, in one of the Arms, and in the opposite Leg. *Purging and Bleeding Spring and Fall.*

On other days, free from purging, let altering and *Cephalick* Medicines be taken twice a day. *Cephalick Remedies.*

Take of the Conserves of the Flowers of the Lilies of the valley (or of the male *Pæony*) six ounces, of the Powder of the Root of the male *Pæony* half an ounce, of humane Skull prepared three drams, of the Seeds and the Flowers of the male *Pæony* powdered, each two drams; of red Coral prepared, of Pearls, and of the whitest Amber, each one dram; of the Salt of Coral four scruples, of the Syrup of the Flowers of the male *Pæony*, what will suffice to make an Electuary: The Dose two drams morning and evening, drinking after it two or three ounces of the following Water. *An Electuary.*

Take of the Roots of the male *Pæony*, of *Imperatorian Angelica*, each half a pound; A distilled Water of the Root of *Zedoary*, of the lesser *Galangal*, each one ounce; of the leaves of the *Orchard Mistletoe*, of *Rue*, *Sage*, and *Betony*, each four handfuls; of the outer rind of

of ten Orenge, and eight Lemons, of Cardomums, Cloves, Nutmegs, each half an ounce; all being cut and bruised, pour to them of white Wine (in which two pints of the dung of the Peacock hath been infused for a day) ten pints: let them infuse, close shut for three days; then distil it according to art, and let the whole liquor be mixed together.

Lozenges.

Take of the Species of Diambra two drams, of the Powder of the Root of the male Pæony, of Zedoary picked, each one dram and a half; of Pearl one dram, of the Oyl of the purest Amber half a dram, of the whitest Sugar half a dram, being dissolved in six ounces of the water of Pæony, and boiled up to a consistence: make Lozenges according to art, each weighing half a dram: Let the Patient eat one or two often in a day, at his pleasure.

Spirits and Tinctures.

Within the fifteenth or twentieth day, that the Remedies may not be irksome, and may profit the better, let them be changed: therefore, instead of the Electuary let there be substituted for two or three weeks, sometimes the Spirit of Sal Armoniack, with Amber or Coral, or else impregnated with humane Skull or Castor; sometimes Elixir of Pæony, or Tincture of Amber or Coral, or Elixir Vita of Quercitan, or the simple mixture: also instead of it, may be drunk compounded Waters, or Water of black Cherries, or Walnuts; or the simple Waters of Rosemary, or Lavender; sometimes a draught of Posset-drink, with Flowers of the male Pæony or the Lilies of the valley boiled in it; or a draught of Tea or Coffee in the morning, (let the water of which it is prepared have such ingredients first boiled in it) or let Chocolate be prepared after this same manner.

Tea, Coffee, and Chocolate prepared, how

to be made and taken.

Take of the Powder of the Root of the male Pæony, of humane Skull prepared, each half an ounce; of the Species of Diambra two drams, make a Powder; to every paper add of the Kernels of the Cocoe Nuts one pound, of Sugar what will suffice; of this make Chocolate: take of it half an ounce or six drams every Morning in a draught of the Decoction of Sage, or of the Flowers of Pæony, or such like.

A Powder.

Take of the Powder of the Root of the male Pæony, of humane Skull prepared, each one ounce and a half; of the pick'd Root of Zedoary, Cretick Dittany, Angelica, Contrayerva, each two drams; make a fine Powder of them all, add to it of the yellow of Orenge and Lemons Candied, each two ounces; let all be beaten to a Powder: take about half a dram, or a dram an hour before and after meals.

For ordinary drink, let a Vessel of four gallons be filled with ordinary Ale, in which six handfuls of white Horehound dried had been boiled, of Anacardine and Cardomums cut and beaten, each one ounce and a half; of it make a bag to hang in it.

Medicat Al.

First of all, a very strict dyet ought to be ordered; let a temperate, dry and open air be chosen; let good and wholesome meats be eaten, and slender meals. Let suppers be sparingly taken, or none at all: Let noon-sleeps, drinking bouts, and other customary things about the non-naturals be shunned.

Examples.

I could here propose many Histories of Apoplectical persons, to wit, of some who were once or twice touch'd, and yet living; and of others who have dyed at the first assault, or in the second or third fit. The most Reverend Father in God the Lord Gilbert Archbishop of Canterbury, recovered of a grievous Apoplectical Fit, six years ago, (God prospering our medicinal help, to whom we render eternal thanks) and from that time, though he sometimes suffer'd some light skirmishes of the Disease; yet he never fell, or became speechless or senseless. But we shall not stay upon this or other examples to unfold them largely, because there is nothing in them very rare, that may illustrate the Aetiology of this Disease. Some of their dead Carcasses I have dissected, but only of such as the cause of death was from some former great hurt of the head, as some blow, or by means of some blast; in all which the extravasated Blood, or an Imposthum was the cause of their death: We have been prohibited often by their Friends, from opening those dying of an habitual Apoplexy, who expecting to have them revive again, held it as a deadly thing, and so wholly forbid Anatomy. But I shall here relate a notable Anatomical observation taken about five years since at Oxford.

A very rare History.

An ancient Divine, an honest and a godly Man, indued with a fat body, a short and brawny Neck, being long unhealthy, and living a sedentary life, contracted a very Scorbucick evil disposition: being troubled with a difficult and laborious breathing, with an heaviness of the Head, and unwonted numness, was scarce able to endure any thing of labour or exercise, more than that he daily went and came from his Chamber to the Chapel and Hall: one Morning he came to the Chapel a little before Prayers begun, and while he was on his knees, he was suddenly struck, and immediately

ately became speechless and senseless, and fell on the ground; but being carried thence, and his cloaths taken off, he was put into a warm Bed. I and other Physicians being presently sent for, and coming as soon as we could possibly, we found him not only without Pulse, sense, and breathing, but all his Body cold and quite stiff; nor could he be recalled to life or heat, by any Remedies or ways of administrations, though used for some time: by which we suspected, that the Pulse of his heart was wholly hindred at the first stroke, and that its flame being put out, presently all motion of the Blood was suppressed.

The next day, seeing the Carcase dead enough, and stiff, we opened it, nothing doubting but that the Distemper so suddenly mortal, would shew clear marks of it within the Head. But there, or in any other part, was not the least shadow of this most cruel Disease: The Vessels watering the *Meninges* were moderately filled with Blood, without any Inflammation or Extravasation: The Brain, the Cerebel, and the oblong Marrow, with all their processes and prominences, appeared every where throughout firm, and well coloured, both without and within: nor was there any Serum or Blood poured forth any where, within the Pores or passages, nor yet within the greater Ventricles, nor heaped up; yea the *Choroëidal* Infoldings placed both within the cavity of the Brain, and behind the Cerebel, seem'd free from all fault; so that the Morbific matter, equally thin and subtil like the Animal Spirits, whom it affected, remained wholly invisible, and we could only argue its presence by the effect.

An Anatomical
Observation.

But lest this should lye hid some where without the Head, after the contents of the head were diligently inspected, we came to the Breast: where the discoloured Lungs being through the whole stuffed with a frothy matter, manifestly shewed the cause of the short and difficult breathing. But the Heart was sound and firm enough, free from any obstruction or fleshy Concretions. Further, neither in the neighbouring parts, or in others about the Viscera, was found any Imposthum or Ulcer, by whose contact or stink, the Heart could be suddenly oppressed, or the Vital Spirits (if this be possible) might be choaked.

Wherefore in this case, nothing could be suspected else, but that the Animal Spirits implanted within the middle of the Cerebel, were put to flight, and as it were extinguished suddenly, by some malignant, or *narcotick*, or otherways deadly Particles, so that the motion of the Heart presently failing, like the first moving wheel in a Clock or Watch, immediately all the other functions, their impulses being taken away, wholly ceased.

CH A P. IX.

Of the Palsie.

THE middle of the Brain, or the *Callous* Body, to which we have assigned the seat of the *Vertigo* and *Apoplexy*, seems also to be the primary distemper'd place in the *Epilepsy*: Concerning which, as also concerning Convulsive Diseases, since we have elsewhere largely treated, we shall therefore here pass over purposely in this part of the Diseases belonging to the Head, and according to our wonted method, descend yet lower, to the other regions of the Brain, and its dependences; and now we shall endeavour next to describe the Distempers which belong to the Streaked Bodies; Oblong Marrow, and also to the Nerves, and nervous Fibres.

The middle of
the Brain,
which is the
Seat of the A-
poplexy is also
the Seat of the
Epilepsy.

We have formerly shewed, that these parts do perform all the functions belonging to motion and sense; wherefore, the failing or the enormities of these, are the affections of those Bodies, or of the Spirits inhabiting them. But indeed sense and motion are hurt chiefly after two manner of ways: to wit, either is wont to be perverted or hindred; when Motion is perverted, Cramps and Convulsions; when Sense, pain arises; when either function or both together is hindred or abolished, the Distemper is thence stirred up called the *Palsie*; which we are at present about to handle. Concerning Convulsion and Pain we have already treated.

The streaked
Bodies, the Me-
dullar Trunks,
and the Nerves,
are the Seat of
the Palsie.

The *Palsie* is described after this manner, to wit, That it is a resolution, loosening, what the *Palsie* or relaxation of the nervous parts, from their due tenacity or stiffness; by which means Mo-

tion and Sense, to wit, either one only, or both together, in the whole Body, or in some parts, cannot be exercised after their due manner.

Its Conjoint Causes are, Obstruction of the passages, and the Impotency of the Spirits.

In the Palsie either motion, or sense only, or both together, is hurt.

Spontaneous motion is abolished by reason of the ways being obstructed, either in their beginnings, or the middle passages, or about the ends.

The ways are obstructed by Impletion, or Compression, or by a breaking of the Unity.

An obstruction in the Streaked Bodies causes the Universal Palsie, or the Palsie of one side.

The nervous parts are loosened, because the Animal Spirits do not sufficiently irradiate them, nor blow them up, nor actuate them with vigor. The cause of which defect is, either an obstruction of the ways, by which their trajection or passage is hindered; or the impotency of the Animal Spirits, for that they are distemper'd with a numness, or that being but few in number they do not lively enough unfold themselves. By reason of these various means of being affected, there arise diverse kinds of Palsies. For in the first place, as to motion by it self, this spontaneous faculty (which is chiefly and almost only lyable to the Palsie) is sometimes taken away in the whole, or altogether in some parts; but sometimes this, being only hindered, is lessened or depraved. Secondly, In like manner also one sense only by it self, or more together, is sometimes wholly taken away, and sometimes only much diminished or vitiated. Thirdly, Sometimes it happens that both powers are hurt at once. We shall speak of each of these in their order; and first of the Palsie, in which spontaneous motion is abolished; which we say is excited from two causes chiefly; to wit, the ways being obstructed, and the Animal Spirits being touched with a numness, or as it were with a certain malignant blast.

As to the former, an interception of the Spirits from the loosned parts, by reason of their passages being obstructed, that always existing above them, is wont to be caused in various places, and for divers causes; but chiefly it happens in the first sensory, viz. in the Streaked Bodies, or some where about the Medullar Trunks, or lastly in the Nerves themselves; and so, either in their beginnings, or middle processes, or in their extreme ends, (i. e.) the nervous Fibres. When the evil or hurt is brought to the Streaked Bodies, or the oblong, or Spinal Marrow, it either obstructs the whole Medullar thread or rope, from whence arises an universal Palsie below the distemper'd part; or one moiety of it, whence comes the Hemiplegia or Palsie of one side; or it affects in one side, or in both at once, the little heads of some Nerves, whence loosnings or resolutions are caused in this or that member apart from the others.

There are many means whereby the ways or passages of the Animal Spirits are obstructed in the aforesaid bodies. First, Either their passages are filled by an extraneous matter impacted in them: Or, Secondly, They are pressed together by Blood flowing out of the Vessels, a Serous deluge, or some Tumor lying upon them: Or, Thirdly and lastly, the unity or continuity is broken; as by a stroke, or wound, or bruise, also by excess of cold or heat. According as these several places are distemper'd, and the several means of their being affected, we shall run thorow the chief cases of the Palsie, together with the Aetiology, or reason thereof, with the manifold appearances of Symptoms in them; and in the first place we will speak of the Palsie arising from an hurt brought to the common Sensory, to wit, the Streaked Bodies.

And indeed, that it so comes to pass, I have proved by ocular inspection, and shall be plainly demonstrated anon by Anatomical observation. Further, as often as an universal or an half Palsie follows, (as it is often wont to do) upon a Lethargy the Carus, or Apoplexy, any one may conceive, that such a change of the Disease, happens from a translation of the Morbific matter; for that this at length going out of the Pores and passages of the Callous Body, which it at first posselt, and sinking down a little lower, runs into the Medullary tracts of one of the Streaked Bodies or perhaps both of them. And so, when the Animal Spirits are hindered from their wonted out-flowing, or irradiation into the nervous Stock, the motive faculty only, or (if the obstruction be very great) both this, together with the sensitive, is hindered.

I have sometimes observed in a Palsie, coming after a grievous fit of some other Disease, that all the moving parts, of either side, have been loosened after a more light manner: For though they were not able to perform the more strong motive endeavours, yet for the most part they could extend, bend, yea and move their members hither and thither, to wit, because the Morbific matter being diffused abroad, thorow both the Streaked Bodies, had not so closely filled every where all the passages: Moreover, on the contrary, I have known in a Palsie of one side, so suddenly excited, that there has been a far greater resolution, so that they so struck, were not able to move any way hand or foot; nor any other member on the distemper'd side. Further, sometimes it happens, from the Morbific matter being copiously fallen down, and obstructing closely all the Medullary tracts of one of the Streaked Bodies, that all the respective parts, have not only been destitute of motion, but some of them

them also of sense; so that some members felt not any painful impression, how vehement so ever it was. Such a Distemper happening in a lesser degree, is wont to excite a sense of numbness, or pricking or tingling, such as in members lean'd or lain upon.

If it be demanded, why sense is not always hindred as well as motion in every *Palsie*, since as it seems either is performed by the same Nerves and Fibres, within the same Medullary tracts, so that one faculty is only the inversion of the other? as to this we may say, that as light beams thorow glass, when wind is excluded, so also sense being safe, oftentimes motion is lost. Besides, sense is only a passion, and a sensible impression, which is propagated from the organ, by a continuity of the nervous process, to the common sensory, without any endeavour or labour of the Spirits; which may be done, though the common sensory be in some measure obstructed, and the Spirits inhabiting it benumbed: But motion is a difficult and laborious action, to which is required, that the Spirits expand or stretch out themselves lively, and not only put forth as it were explosive endeavours in the moving organs, but chiefly about the parts, where the beginning of the motion and its first force is, and from thence, in the whole passage thorow the nervous parts. Wherefore, as but a few Spirits and bound, suffice for sense; many, free, and expeditious as to their expansions, are required for motion.

Why sense is not hindred as well as motion in every Palsie.

But that the Morbific matter being slid down into the Streaked Body, the Muscles of the Eyes, Mouth, and Face, do still retain their motions; it is because that some of them, about the beginning of the Spinal Marrow, below all the Nerves, arising from the oblong Marrow, have their place of obstruction; I say, that it is so, because the Nerves destined to the aforesaid Muscles, (the motions of which are stirred up by natural instincts) and brought from the fifth and sixth pair, even as the Nerves serving the Præcordia and Viscera, derive chiefly the influences of the Animal Spirits from the Cerebel; whose regiment, though the Streaked Body be distemper'd, remains often unhurt.

In an universal Palsie why all the Muscles of the Eyes and Face are not loosned.

Not only an obstruction of the Streaked Body, but also a compression sometimes causes the *Palsie*, as shall be shewed by and by from *Anatomical* observation; to wit, when the blood is extravasated, and growing cloddy within the inferior cavity of the Brain (and perhaps a Serous deluge is there heaped up) and doth lie heavily upon the Streaked Body, and press it together, so that for that reason, the Medullary tracts being bound together, are hindred from the Spirits flowing into them.

A Compression of the streaked Body sometimes stirs up the Palsie.

Next after the Streaked Bodies, the seat of the Morbific Cause is in the oblong and spinal Marrow; also sometimes in these, though rarely an obstruction, but more often a compression, or a solution of the unity, excite the *Palsie*.

A Paralytick obstruction doth sometimes happen in the Ob-long and Spinal Marrow.

As to the former, it is not probable, that great plenty of Morbific matter should be sent from the Brain, into this or that part together and in heaps; for such a great and sudden flux hardly happens beyond the streaked Bodies. But it may be suspected, that *Narcotick* or otherways deadly Particles, being forthwith poured forth into the Brain, and from thence thrust forth into its appendix, doth at first stick within the more narrow spaces of the Medullary Trunk, and then by degrees being heaped up, causes the *Paralytick* obstruction, whilst these Particles are carried in the Brain here and there, in the *Callous* or Streaked Bodies they stir up frequent *Vertigoes*, and mists before the eyes, and sometimes in the motive parts short numbnesses; but these being by degrees heaped up together within the Trunk of the oblong Marrow, or the spinal, forasmuch as they possess all or part of its passage, and by that means either obstruct all the Pores of the Spirits at once, or some ranks or orders of them, they bring forth either an half *Palsie*, or a loosening of some members, sometimes the superior, sometimes the inferior.

I have observed in many, that when the Brain being first indisposed, they have been distemper'd with a dullness of mind, and forgetfulness, and afterwards with a stupidity and foolishness, after that, have fallen into a *Palsie*, which I often did predict; to wit, the Morbific matter being by degrees fallen down, and at length being heaped up some where within the Medullary Trunk, (where the Marrowy Tracts are more straitned than in the Streaked Body) to a stopping fulness. For according as the places obstructed are more or less large, so either an universal *Palsie*, or an half *Palsie* of one side, or else some partial resolutions of members happen.

A Palsie often succeeds stupidity, or becoming foolish.

But in either Marrow, and especially the Spinal, an interception or inhibition of the Spirits, creating a *Palsie*, most often happens from a compression, or a breaking of the unity: The extravasated Blood, or the Corruption flowing from the broken Imposthum, and perhaps a Serous deluge being deposited within the hollowness of the Back-bone; yea also an hard Tumor, being risen somewhere in it, by pressing

A Palsie sometimes from the pressing together of the Marrowy Cord.

Sometimes from the unity being broke.

The Seat of the Palsie sometimes in the Nerves themselves, which are either obstructed, or compressed, or the unity broken.

1. An Obstruction. Sometimes in the beginning of the Nerves.

2. Sometimes in the middle.

3. Or in their utmost processes.

The other conjunct cause of the Palsie, to wit, the impotency of the Spirits;

Often arises from narcotick or vitriolick Particles, by which the Spirits are put to flight.

In every Palsie the matter is not so thick or cold, as it is vitriolick or other ways infectious to the Spirits.

The blasting or withering in Trees like the Palsie

together the marrowy rope, shuts up the ways of the Spirits. Further, either a stroke, wound, or bruise of the Head, or spine; yea and a distortion of this latter, do often pervert or break off the Marrowy Tracts; yea an excess of cold taken in Frost and Snow, straitens and stops up the passages of the Spirits. Those kind of cases, and instances, being obvious enough to common observation, there will not be any need here to speak of them particularly, or to unfold them more largely.

Thirdly, The Morbific cause being sometimes planted lower, possesses either the greater Trunks, or the lesser shoots of the Nerves themselves; and that likewise is either an obstruction or a compression, or a breaking of the unity, by reason of any of these ways, and according to the like means of affecting, within the nervous passages, as in the marrowy, it is wont to be excited.

The oppilative or stopping Particles being fallen down, from the Brain, and carried forward into the oblong Marrow, enter into the Nerves, destined to the Muscles of some parts of the Face, and by obstructing the ways of the Spirits in them, bring forth the Palsie in the Tongue, and sometimes a loosening in these or those Muscles of the Eyes, Eye-lids, Lips, and of other parts; and then by reason of the contrary Muscles being contracted beyond measure, they stir up a Cramp or Convulsion in the opposite part.

Nor is it less usual, for the same Particles, for that they are fewer, to be carried yet further, without any great hurt into the Spinal Marrow; and lastly going forth from it, to run sometimes into the several Trunks of the Nerves, and sometimes into some handfuls of them; and for that reason, to induce the Palsie to the several Muscles or members, or in some of them only. As often as for this cause, the Muscles of one side of the Neck are resolved, or loosened, the other opposite being too much contracted, render the Neck twisted or awry. It ordinarily happens, by reason of some private Nerves being so obstructed, for some Fingers of the Hand, or Toes of the Feet to be loosened. But if many handfuls of Nerves together happen to be stopped, a Palsie follows, oftentimes in the whole Arm or Thigh. It would be too tedious to mention every case here, by which the Nerves are wont to be stopped, about their beginnings, middle processes, or utmost ends, to wit, the Membranaceous or Musculous Fibres, by reason of compression, or breaking of the continuity, and so deny the exercise of the moving faculty to the respective parts. The reasons of these kind of Distempers are so clear and manifest, and so commonly known, that it would be superfluous to insist on the opening them any longer. But we shall rather pass to the other conjunct cause of the Palsie, which more immediately affecting the Animal Spirits, and sometimes striking down, and as it were extinguishing them, by mere contact, or as it were by a malignant blast, brings in a resolution or loosening in the respective parts.

What we before affirmed in the Apoplexy, we now again do the same in the Palsie, that there are deadly Particles, not only oppilative or stopping, but sometimes Narcotick or Scurfactive, and as it were extinguishers of the Spirits; which kind of affection, if it be strong, causes sometime Paralytick Symptoms, without any great obstruction of the ways. The breath or steams of Antimony, Mercury, or Auripigment, often causes weakneses, tremblings, and loosening of the Members, in such are long conversant among the Furnaces of Chymists, and of Metals. We may in like manner believe, that in some Scorbutick and very Cacochemical people, heterogeneous Particles, and as it seems of a Vitriolick nature (passing thorow the Brain, and its marrowy appendix) do enter into the nervous passages, together with their watering Juice, and cast down some handfuls of the Spirits in them, or suppress their motion. Hence suddenly arise stupors, numness, or looseness in the Members, or Muscles, sometimes in these, sometimes in those, and soon after vanishing in one place, presently spring up again in another. But at length, when these sort of Particles being abundantly poured forth into the Nerves, and laid up in heaps, they become variously fixed here and there; and moreover, shut up the ways of the Spirits, and so cause a fixed and permanent Palsie. And indeed, in every Palsie, made by obstruction, the Morbific matter is not thick and cold Phlegm, (as Galen and many other Physicians have asserted) for such doth not pass thorow the Brain, much less the nervous passages; but it seems to consist of most subtil and very active Particles, though infectious or deadly to the animal regiment. But indeed the Palsie happens in Men, no otherwise than the blasting, or burning, or withering in Trees; because some winds being induced with very frigid or cold blasts; to wit, with a Nitrous or a Vitriolick Spirit, when they blow upon the green and tender sprigs of trees, cause them suddenly to wither, for that the tender stalks like Nerves every where inter-woven with the sprigs and leaves, are bound together by the blast of the malignant air so fully, that

that they receive not any more the Juice sent from the Trunk or Root, by reason of which defect they wither. Much after the same manner, extraneous Particles, and as it were *Vitriolick*, being admitted within the organs of sense and motion, for that they at once bind up the Pores, or cast down or suppress from motion the Animal Spirits, cause in the respective parts, as it were a withering or drying up. But this is not so caused by mere Phlegm, or a Serous flood, as plainly appears, because those indued with a moist and cold Brain, have always their Nose and Eyes moist, with the distillation of a stotty or watry humor; yea those who are troubled with a Dropsical Brain, in which the Brain, and the tops of either Marrow do as it were swim in water, are not for that reason disposed to the Palsie, unless by the pressing together of the Marrow.

We have hitherto described the various cases of the Palsie, and the means by which it is caused, together with their several formal reasons, and conjunct causes. As to what belongs to the other causes of this Disease we must first distinguish, that it is either accidental or habitual: The former happens to some, from a solitary evident cause, such as a stroke, wound, bruise, and excess of either heat or cold, without any previous disposition; and besides this, and the conjunct cause, which for the most part is a compression, or breach of the unity, it hath none: The habitual Palsie depends upon a *Procatartick* cause, which is always an extraneous, and as it were a *Vitriolick* matter begotten somewhere before, and heaped up, which being from thence suffused into the organs of sense and motion, for that it stops up the marrowy or nervous Tracts or sometimes profligates the Spirits by mere contact, or effects both together, brings forth loosening in the respective parts, by reason of the influence of the Spirits being deny'd them.

This kind of *Procatartick* or foregoing Cause, depends upon a twofold antecedent or secret leading cause, to wit, one remote, which is a vicious Blood, carrying to the Head a Morbific matter, either begotten in it self, or taken from the Bowels, or some other place; and the other more near, which is an indisposed Brain, to wit, weak, and too lax or loose, or otherways evilly made, and so easily admitting heterogeneous, or strange and deadly Particles.

The Morbific matter being brought to the Brain, sometimes induces the Palsie primarily, but more often secondarily, and not but after other Diseases first excited.

The reason of the former, (to wit, that the habitual Palsie be a primary Disease, and by it self) requires these two things, *viz.* That the heterogeneous Particles be disposed chiefly for the causing or stirring up the Palsie; then that they be admitted by degrees, and but in small quantity, for if they enter in great heaps, they would first cause the *Carus* or *Apoplexy*: and if they be not of a plain *Vitriolick* nature or quality, when having passed thorow the Brain, they come to enter into the organs of Sense and Motion, they would first occasion in them Convulsive and painful Distempers, yea sometimes the *Colick*, *Gout*, or *Scurvy* first, and then at length, the Palsie.

The secondary Palsie often succeeds Distempers for the most part *Chronical*, after the natural and vital faculties being by them very much hurt: a slow and long *Fever*, strength being at length worn out, causes oftentimes enervations or resolutions of the whole Body, or of some Members. Long and immoderate sadness, a Consumption, a *Scorbutick Atrophy* or wasting, being long fixed in Bed, unhealthy old Age; yea and many other passions, after a notable evil first brought to the Brain, and nervous Stock, at length brings on the Palsie. But indeed this Disease more frequently comes upon some other Distempers, either of the Brain, as chiefly the *Carus* and *Apoplexy*, or of the nervous stock, and such chiefly are the *Scurvy*, *Convulsions*, *Colick*, and *Gout*. By what means it succeeds *Cephalick* Diseases, we have already shewed in this; and how the *Scurvy*, in another tract: we shall now inquire how it is often the off-spring of the other three.

1. We have shewn already, that the *Spasme* or *Cramp* or *Convulsion*, doth sometimes bring in the Palsie, to wit, when from contrary or opposite Muscles, being one of them loosened and the other pulled together: Further, it is an usual thing, for those who are long obnoxious to Convulsive Distempers, to suffer at length debilities in some members, and at length resolutions or want of motion. I have known many *Epileptical* persons, and others troubled with Convulsions, by reason of the motive function being abolished or inhibited, in this or that part, to become at first lame, and then Bed-ridden; the reason of which seems to be, because the Morbific matter, being continually admitted within the tracts of the Brain and its appendix, both medullar and nervous, and often thrust forth, doth at length so debilitate and dilate

The more remote foregoing causes of the Palsie, which are two:

1. More remote, to wit, a vicious Blood, and for that reason pouring forth a deadly matter upon the head.

2. Nearer, to wit, a weak and loose Brain, admitting the evil Particles. The Palsie is either a primary Distemper, and a Disease of it self,

Or secondarily, *viz.* Coming upon or succeeding other Diseases.

Wherefore the Palsie often succeeds Convulsive Diseases.

dilate them, so that it gives an open passage besides to other kind of Particles, either *Narcotick* or *Vitriolick*; by reason of which, the *Palsie* comes after the Convulsion. Further, I have often observed, by reason of the diverse mingling of the Morbific matter, (like as when Rain and Snow happen together) that the sick have at once been infested both with Convulsive motions, and the *Palsie*. A notable example of this, with the reason of it, we have fully described in our Tract of Convulsive Diseases, Chap. IX. p. 115.

Wherefore the
Distemper of
the Colick,

2. They who are frequently and grievously obnoxious to the *Colick*, at length become also *Paralytick*. The case is so frequent here, that the succession of this Disease is accounted among its *prognosticks*; for those who are wont to suffer cruel fits of torments in the Belly, returning by intervals, or are troubled with pains about the Viscera of the *Abdomen*, cruel and almost continual, at length have wandring pains in their Body and Members, and then afterwards stupors or numbness, and lastly resolutions or want of motion. The cause of these effects proceeds, both from the seat of the Disease, and the Morbific matter being changed, to wit, this, which being very small but sharp and irritative, runs only into the *Splanchnick* Nerves, and so by reason of the Fibres of the *Viscera* being pulled, did stir up in them Cramps and pains; afterwards becoming more copious, and also duller and *Narcotick*, pours down thorow the *Spinal* Marrow, and entering into the Nerves destinated to these or those Members or Muscles, brings forth resolutions in the respective parts. We shall more largely shew the reason of this, when we treat of the *Colick*.

3. Wherefore the
Gout.

It is a very ordinary observation, that the *Palsie* comes upon the *Gout* frequently, in the Members obnoxious to it; the reason of it is easily known, forasmuch as in this sickness the Morbific matter is twofold, and doth depose salt and as it were lixivial Particles thorow the Arteries, and as we suppose others sourish or acetous to come to them by the Nerves; (as shall be more largely shown hereafter) it is no wonder, if that at length, other sorts of Particles become companions to them, by other beaten ways, and at length either by filling or by compressing, obstruct the very small passages of the Spirits.

The evident
Causes of the ha-
bitual Palsie.

As to what belongs to the evident causes of the *Palsie*, to wit, for what fore-causes or occasions those disposed to this Disease contract it the sooner, or that having been taken with it already, are yet wont to be more grievously tormented; I say, whatsoever doth more vitiate the Blood, also those things that stop up the Brain and its nervous appendix, or stir up suffusions of the Morbific matter in it, also what do inflict a *Narcosis* or stupefaction to the Spirits, or lessen their numbers, may be brought hither. In this rank first occur the disorders in the six non-naturals, an evil manner of living, drinking thin clear Wine, or strong hot liquors, too much sleep, or too untimely, an idle and sedentary life, immoderate *Venus*, too much loss of blood, a moist Air or Marshie dwelling, an House new Plastered, Metalick fumes and vapors, frequent use of *Narcoticks*, or stupefying Medicines, or too much taking Tobacco, excess of cold, heat, or moisture, vehement and long passions, of sadness or fear, with many others, all which we have not here leasure to recite.

Want or paucity
of Spirits of-
tentimes the
Cause of the
Spurious or Ba-
stard Palsie.

Thus much concerning the *Palsie*, in which the loco-motive faculty is abolished or lost, or very much hindered; by reason of the ways of the Spirits being obstructed, and themselves affected with a certain stupefaction, in the whole, or in the respective parts. There follows another kind of this Disease, depending upon the want and fewness of Spirits, in which, although motion be not deficient in any part or member wholly, yet it is not performed by any but weakly and depravedly only. For though the distemper'd are free from want of motion, they are not able however to move their members strongly, or to bear any weight; moreover, in every motive indeavour, they labour with a trembling of their limbs, which is only a defect of debility, and of a broken strength in the motive power. For when strength is wanting for the lifting up of any member firmly, and at one essay or endeavour, Nature flagging, acts with a more often repeated tryal or endeavour, and so the part being in motion, is compelled as it were to shake and tremble. To which happens, that when the nervous Fibres flagging or growing weak, they are not able to sustain the Tonic endeavour, or the stiffness in the Animal regiment, and these endeavouring or striving to exert or put forth their utmost power, enter into motions as it were Convulsive, and reiterate them perpetually. Wherefore, in some *Paralyticks*, there is always a trembling and shaking in all the limbs.

Those who thus become *Paralytick*, by the paucity or want of Spirits, and so from their small or diminished dispensation into the nervous System, are made obnoxious to such a Distemper, by reason of various causes and occasions.

First,

First, Extreame or unhealthy old age, or immoderate loss of blood, or the genital humor, induce this kind of *Paralytick* disposition in many men; to wit, because from the wasted blood and almost liveless, there is stilled forth into the Brain but a very small stock or provision of Animal Spirits.

For this Reason
Old Men are
obnoxious to
this Disease.

Secondly, Almost for the same reason, the loco-motive faculty grows weak or fails in persons greatly *Scorbutick*, and such as are full of indigested juice; for such not being fit for any strong exercise, go infirmly and weakly, and are very much tired by any long or swift walking; further, by any more heavy endeavour, they suffer often times a numbness in their limbs, with an impotency of moving them. For indeed, the bloody Mass is in these very watry, and stult with impurities, and for that the Brain being weak and loose, as to its Pores, admits easily all sorts of filthinesses into it self; wherefore, fewer Animal Spirits being only created, and those not clear and subtil, but dull and hindred, by the adhesion of a more thick matter (although there is not always an obstruction of the ways, or a *Narcotick* disposition) they are not able to unfold themselves into motive endeavours.

2. Also Scorbutical Persons, and such as are full of ill humours.

Thirdly, Not only *Scorbutical* persons, but also many others, hardly and long growing well from some *Chronical* Disease, are distemper'd with Members very much loosened from their due vigor and strength, and with a languishing of their Limbs; that though they are well in their stomach, and have a good and laudable Pulse and Urine, yet they are as if they were enervated, and cannot stand upright, and dare scarce enter upon local motions; or if they do, cannot perform them long: yea, some without any notable sickness, are for a long time fixed in their Bed, as if they were every day about to dye; whilst they lye undisturbed, talk with their Friends, and are chearful, but they will not, nor dare not move or walk; yea they shun all motion, as a most horrid thing. Without doubt in these, although the Animal Spirits do after a manner actuate and irradiate the whole nervous Stock, yet their numbers are so small, and in so few heaps, that when as many spirits ought to be heaped together somewhere in it for motion, there is great danger lest presently in the neighbouring parts, their continuity should be broken. Wherefore, when the spirits inhabiting the Brain, are conscious of the debility of others disposed in the Members, they themselves refuse local motions, for that it would be too difficult a task to impose on their companions; wherefore, the sick are scarce brought by any perswasion, to try whether they can go or not; Nevertheless, those labouring with a want of Spirits, who will exercise local motions, as well as they can, in the morning are able to walk firmly, to sling about their Arms hither and thither, or to take up any heavy thing; before noon the stock of the Spirits being spent, which had flowed into the Muscles, they are scarce able to move Hand or Foot. At this time I have under my charge a prudent and an honest Woman, who for many years hath been obnoxious to this sort of spurious *Palsie*, not only in her Members, but also in her tongue; she for some time can speak freely and readily enough, but after she has spoke long, or harshly, or eagerly, she is not able to speak a word, but becomes as mute as a Fish, nor can she recover the use of her voice under an hour or two.

3. Also others long sick.

Hence some dare not venture on local motion.

Others endeavouring, cannot bear them long.

In this kind of spurious *Palsie*, arising from the defect, or rather the weakness of the Animal Spirits, than from their obstruction, it may be suspected, that not only the Spirits themselves, as to their first numbers of them, and particular originals, are in fault; but besides, that sometimes the imbecillity and impotency of local motion, doth in some measure also depend upon the fault of the explosive Copula, suffused every where from the blood, into the moving Fibres. For indeed, from a very *Cacochymical* blood, or full of juice, and for that cause vappid, and liveless; as the Animal Spirits are but few, that are instilled into the Brain, so it is probable, that those themselves derived from the Brain, into the Nerves, being disposed at length within the muscular Fibres, do meet with other Nitro-sulphureous Particles (which we have somewhere shown to be necessarily required to the Muscular motion) from the so vitious blood that are but dull, and degenerate, from the Elastick power; wherefore indeed the Spirits being concreted so evilly within the Muscles, even as Gunpowder being full of more thick feculences, rarely and weakly perform the acts of explosions.

The Impotency of the Spirits proceeds in some measure from the defect of the explosive Copula.

As to what belongs to the other species of the *Palsie*, in which the sensitive faculty is also affected, we say, that this is hurt either by it self, or together with the motive; and such an hurt of both together, doth almost only happen, so far as the passages and ways of the Spirits are more firmly shut up, so that whether they tend forward or backward all their irradiation is intercepted: That sometimes happens, though rarely from the Morbific matter fallen down from the Brain into the oblong Marrow, but more often by reason of a grievous hurt of the Spine or Back-bone,

2. The kind of Palsy, in which Motion and Sense are hurt at once

as from a fall from on high, stroke, or wound inflicted on them: For from such occasions, by compressing the marrowy cord, or by too much distending or writhing it, all the tracts of the Spirits are blotted out.

3. Kind, in which sense only is affected.

Sometimes the sensitive faculty is hurt by it self, the motive being still safe; this is sufficiently obvious, and the reason very clear, of the organs, whose Nerves are only sensible, to wit, as of the sight, hearing, tast, and smell. But indeed, that in the extream habit of the body or members, the touch or feeling sometimes perishes, the loco-motive power being unhurt; as is ordinarily discerned in Lepers, those distemper'd with the *Elephantiasis*, and some Mad-men, who are wont to go naked, and lye on the ground, whose skin and muscous flesh are so benumbed, that they feel not the gashes made in their flesh with a Pen-knife, nor Needles any where thrust into them; this I say seems very hard to be unfolded. But as to this it may be said, that perhaps the same Nerves, carry the instincts of motions, and the impressions of sensible things forward and backward, or to and fro, but that the same Fibres, which are loco-motive, are not altogether or chiefly sensible. We have elsewhere shewed, that its power is performed by the tendinous and muscous Fibres; but the sensible Species, is almost only received by the membranaceous Fibres; wherefore, the outer skin is the primary organ of feeling; after this, the Membranes covering the Muscles, and lastly those constituting the Viscera, are somewhat affected by the Tangible object. Wherefore, the loss or hurt of feeling arises, by reason of an hurt, brought to the exterior Membranes; to wit, when the Fibres of these are obstructed by a *Vitriolick* matter, or are benumbed very much by excess of cold; so that the Animal Spirits, which ought to receive their impressions, are excluded from their organs. And indeed, from hence it appears, that these inhabiting the exterior Membranes, are only affected; because sense being lost, the members wither not, as when deprived of motion, but remain full and round; which is a sign that the Animal Spirits entering still the Nerves, and fleshy Fibres, do contribute their virtue to the office of nourishment; after what manner we have already shewn; but when motion is lost, the Spirits are almost wholly banished from those parts, and the flesh consumes, because the nourishing matter, though carried thorow the Arteries, is not assimilated. We have largely discoursed of this in our Treatise of the Nerves.

Wherefore feeling is sometimes lost, and motion safe.

What is the proper Organ of feeling.

The Prognostick of the Palsie.

The Theory of this many-form'd Disease being now at length finished, its kinds and differences, all, or at least the most and chiefest of it, together with the reasons of each of them, being rehearsed in order, we shall shew next those things which belong to its prognosticks and Cure.

1. Every *Palsie*, whether accidental or habitual, and either of them, whether universal or partial, or whether suddenly excited or by degrees, if it happens that the knowing and vital faculty be unhurt, it ought not to be accounted an acute Disease; but being free from sudden danger, admits a long Cure, or at least an endeavour of it.

2. This Disease coming from a solitary evident cause, as from a stroke, a fall, wound, &c. or coming upon the *Apoplexy*, *Carus*, *Convulsion*, the *Colick*, or other Distempers of the Brain, or nervous System, if it be not in a short time altered for the better, or gives not place to Medicines, it remains for the most part incurable.

3. If that a total resolution follows, from a total obstruction in the beginning of the oblong Marrow, or from the Back-bone being vehemently hurt, and that sense and motion are both taken away, the Distemper is hardly, or scarce at all to be Cured.

4. Those who are once cured of a *Palsie*, arising from an evident solitary cause, do not so easily relapse into the same, as when the Disease depends upon a *procatartick* cause.

5. A *Palsie*, happening to men of years, to *Cacochemical*, very *Scorbutical*, and intemperate persons, although the Distemper be not very great, is difficultly Cured.

Its Cure.

As the *Palsies* are manifold, and are from diverse causes, so the Cure is not to be instituted always after one manner, but after a various method, to wit, appropriate to every kind of this Disease. For the most part there are these three kinds of it;

Three means of healing, according to which this Disease is,

1. Either accidental; 2. The off-spring of another Disease; 3. Habitual.

or rather there are three means of healing; of which there ought to be had concerning the Cure of this Disease, now this, now that, or now another; to wit, because resolution (whatever, or in what place soever it be) is either caused, 1. from an external accident, as a stroke, a fall, a wound, excess of cold, or the like, suddenly: Or 2. It succeeds to some other Distemper, as the *Apoplexy*, *Carus*, *Colick*, or a long Feavour: Or, 3. It is primary and a Disease by it self, by degrees excited, and depending upon a *procatartick* cause, or a previous provision. Concerning each of these, we shall speak particularly.

1. Therefore

1. Therefore, when the *Palsie* is caused, by reason of some accident, with a vehement hurt, there are not many intentions of healing; but only that the part hurt may recover its pristine conformation: And first of all, that the Blood and other humors flowing to it, being weak and distemper'd, and staying there, might not increase the hurt; *Phlebotomy* is most requisite in this case, and presently to be celebrated; then the belly being made slippery by the use of Clysters, and a slender dyet, if the matter requires it, let there be instituted either easily digested meats, or moderate *Hydroticks*, or water meats; to wit, that whilst the sick is kept in bed, He may continue in a gentle sweat, that all the superfluities may copiously exhale from the hurt part, and that the Spirits being gently agitated, may repeat their former ways and tracts, within those Pores and passages, so unlocked by the warm Effluvia's.

1. The Cure of the former.

For this end, the Powder *ad Casum*, described in the *Augustan Pharmacopœa*, or as *A Powder for a Fall*, it is in ours, is of common use; let there be given of *Irish Slate*, to the quantity of about a dram, in a draught of white Wine warm'd, or of Posset-drink made of it; and repeated every six or eight hours. Besides, if there be at hand the *Decoctum Traumaticum*, let it be taken ever now and then, frequently in Posset-drink, or a Decoction of the Roots of Madder, or of Butter-bur, or of *St. Johns-wort* Flowers.

Further, in the mean time, let the distemper'd part be carefully lookt to, which may be easily known, partly from the hurt inflicted, and partly from the loosened members. If there be any thing dislocated in it, you must take care that as soon as it can, it may be put again in its place; if a Tumor, Contusion, or a wound be excited, they are to be succour'd by *Balsams*, *Liniments*, Stuphes or Fomentations; or Pulses: But if nothing preternatural appears outwardly, let a Plaster of *Oxy-crocium* and of Red-lead, each alike, what will suffice, be laid upon it, and let the sick be kept quiet, and in a moderate heat, for three or four days. If the resolution remains confirmed, and the afflux of new matter be not feared, let more resolving and discussing Remedies be applied to the distemper'd places; wherefore, make use of Fomentations, and hotter Oyntments, yea natural Baths, if they are at hand, or at least artificial. Sometimes it may be expedient for the distemper'd Members to be wrapped in Horse-dung, or in warm grains, and to be kept so for some time; and lastly, between whiles, besides the use of these, to add Clysters and gentle Purges. But if no help follows these administrations, the sick ought then to be handled with the like long method, and with the same Remedies, as those that have an habitual *Palsie*, or any other coming upon other Diseases and confirmed; which means of Cure, for every common *Palsie* more deeply rooted, shall be shewed anon.

Topics to be applied to the Distempered part.

2. When the *Palsie* coming upon a *Feavour*, *Apoplexy*, *Camus*, or other *Cephalick* or Convulsive Diseases, is greatly and suddenly excited, first the Physician ought to endeavour the taking away of the conjunct cause, which hath almost ever its seat in the oblong or spinal Marrow: Wherefore, at the beginning of the Disease, Blood-letting, and Purging (if nothing shews the contrary) Clysters, Vesicatories, Cupping-glasses, Sneezing Powders, Oyntments, and other administrations used in *Cephalick* Diseases, to wit, which by any means may shake off, or pull away the deadly matter, fixed to the Medullary Trunk, or to the little heads of the Nerves coming from it, are to be made use of. If that at first, the force of Medicine effects nothing within fifteen or twenty days, for that the Distemper is radicated, and become habitual, it must be expunged by a long method, and equally by preservatory as well as curatory Indications; of which we shall speak anon.

2. How the *Palsie* coming upon another Disease is to be cured.

3. The habitual *Palsie*, depending upon a *procatartick* cause, whether it be in fieri or in disposition, or whether it be made, or in the nest or bird, either requires a peculiar means of healing.

The Cure of the habitual *Palsie*.

There are two chief causes of the former, in both which the Curatory Method, respecting only the fore-leading Causes, is designed after the like manner, to wit, whether any falling dangerously ill of the *Palsie*, or growing well of it, relapses into danger, the same Remedies almost are to be insisted on.

Whilst it is in fieri, or doing.

The intentions therefore of healing are, First, That the offices of *Chilification*, and of making of Blood, be rightly performed, and matter for the procreating the Animal Spirits be supplied, both laudable and sufficient to the Head; then, Secondly, That the Brain being still firm and well made, the heterogeneous Particles being excluded, it may admit all that are fitting, and rightly exalt then into Animal Spirits. For these ends, I think convenient to propose the following method, which ought to be varied, according to the various constitutions of the sick,

The Intentions of healing respect the Blood and the Brain.

In Spring and Fall; that they enter into the ordinary course of Physick, yea the whole year besides, some Remedies are in constant use. Blood-letting is not always convenient to all men: But though we forbid this, it is not for the same reason with the

the Ancients, supposing the *Palsie* to be a cold Disease, but because the Animal Spirits, are both procreated out of the Blood, and become also Elastick in the motional Fibres, by reason of the bloody *Copula*; therefore, if plenty of this be taken away, they grow weak and deficient. Which thing indeed I have observed in many, and for the most part languishings and tremblings to have been begun in the Arm, out of which the blood had been taken. However in some, indued with a sharp and hot blood, and apt to flame forth too much, though disposed to the *Palsie*, it is sometimes convenient to let blood a little and sparingly.

Bloodletting.

A Purge.

Cephalick Remedies.

About the *Aequinox*, a Purge ought to be instituted, and after due times between, to be iterated three or four times. But first, if nothing oppose, let a Vomit be given, of the Salt of *Vitriol*, *Sulphur* of *Antimony*, or an Infusion of *Crocus Metallorum*, or of *Mercurius Vita*; then let there be taken Pills of *Amber*, or of *Aloephagina*, by it self, or with the *Resine* of *Jalap*, every seventh or eighth day. At other times we prescribe *Cephalick Remedies*, such as in the sleepy Diseases: viz. *Electuaries*, *Powders*, *Spirits*, and *Volatile Salts*, *Tinctures*, *Elixirs*, with distilled Waters and *Apozems*, sometimes these, sometimes those, or others. Let Issues be made in the Arm or Leg, yea in fat people, and such as are full of ill humors, in both together, or between the shoulders. Let them drink all the year medicated Beer of Sage, Betony, Stechades, Sassafras Wood, and Winterines Bark. Wine and Women ought to be forbidden, or but moderately to be used.

2. How the Disease in habit is to be cured.

Bloodletting and Purging cautiously and rarely to be admitted.

Altering Medicines ought to be given with choice.

If that the *Palsie* be excited, after a previous disposition, either of one side, or in some members, and that it still continues, notwithstanding the first attempt of Medicine, a long and complicated method is always requisite, and oftentimes doth not suffice; for not only the Disease, or its conjunct cause, or its foregoing severally, but all together ought to be opposed: for which ends *Phlebotomy* being for the most part interdicted, only a gentle Purge and rarely is convenient. Besides, some *Cephalick Medicines*, and *Antispasmodicks* are wont to help against the foregoing cause of this Disease. But all of this sort, are not convenient to all; yea as we have observed in the Scurvey, according to the various Constitutions of the Sick, there are also Remedies of a diverse kind and virtue. For to *Cholerick Paralyticks*, to wit, in whose sharp and hot Blood there is much of *Salt* and *Sulphur*, and very little of *Serum*, the more hot Medicines and indued with very active Particles, are not agreeable, yea are often hurtful; which things notwithstanding are very profitable to *Phlegmatick* persons, whose Blood is colder, and contains much of *Serum*, and but few active Elements. Wherefore, for this twofold state or condition of sick persons, it seems convenient that we institute here a double Method of Cure, and two classes of Medicines, of which these may be given to cold *Paralyticks*, and those to the hot.

How the Palsie is to be healed in a cold temperament.

In the former case, for the taking away the *Procatarrick* cause, after Vomiting and Purging being rightly instituted, I was wont to prescribe according to these following forms.

Electuary.

Take of the *Conserues* of the leaves of the Garden Scurvy-grass, of *Rocket*, made with an equal part of *Sugar*, each three ounces; of *Ginger Candied* in *India* half an ounce, of the rinds of *Oranges* and *Lemons* Candied, each six drams; of the Powder of the Claws and Eyes of *Crabs*, each four scruples; of the Species of *Diambre* two drams, of *Winterens Bark* one dram and a half, of the Roots of *Zedoary*, the lesser *Galingal*, of *Cubebs*, the Seeds of *Water-Cresses*, *Rocket*, each one dram; of the Spirits of *Scurvy-grass*, *Lavender*, each two drams; of the Syrup of *Candied Ginger*, what will suffice to make an *Electuary*. Take of it about the quantity of a Walnut, at eight of the Clock in the Morning, and at five in the Afternoon, drinking after it a pint of the following Decoction, warm, or Coffee, with the leaves of *Sage* boiled in it six ounces, or of *Viper Wine* three ounces.

Coffin.

A Decoction.

Take of the shavings of *Lignum Sanctum* six ounces, of *Sarsaparilla*, and of *Sassafras*, each four ounces; of white and yellow *Sanders*, of the shavings of *Ivory*, of *Harts-horn*, each half an ounce; infuse them according to art, and boil them in sixteen pints of Spring water, till half be consumed, adding of *Crude Antimony* in Powder, and tied in a rag four ounces, of the Root of the Aromatick Reed, of the lesser *Galingal*, each half an ounce; of the *Florentine Iris* one ounce, of *Cardamum* six drams, of *Coriander* Seeds half an ounce, six Dates, make a Decoction to be used for ordinary drink.

Spirits.

Going to sleep, and first in the morning, let a Dose of the Spirits of *Sue*, or *Harts-horn*, or of *Armoniacal Amber*, or of *Blood*, &c. be taken, with three ounces of the following distilled water.

A Distilled water.

Take of the leaves or roots of *Aron* one pound, of the leaves of *Garden Scurvy-grass*, of

of the greater Rocket, of Rosemary, Sage, Savory, Thyme; four handfuls; of the Flowers of Lavender three handfuls, the outer rinds of ten Oranges, and six Lemons, of Winterans Bark three ounces, of the roots of the lesser Galingal, of Calamus Aromaticus, the Florentine Iris; each two ounces; of Cubebs, Cloves, Nutmegs, each two ounces; all being cut and bruised, pour to them of white Wine, and of Brunswick-Beer or Mum, each four pints: distil it in common Stills, and let all the liquor be mixed together.

Sometimes in the place of the Electuary may be taken for fifteen or twenty days a Dose of the Tincture of Sulphur Turpented, of the Tincture of Antimony, or of Ambr: Also sometimes Elixir Proprietatis, or of Pæony; let them be taken in a spoonful of distilled Water, drinking after it three ounces of the same: Also sometimes the following Powders or Lozenges may be taken by turns, in the medical course.

Take of the Powder of Vipers flesh of Montpellier prepared one ounce, of the hearts and livers of the same half an ounce, of Species Diambre two ounces; make a Powder, take one dram once or twice a day with the distilled Water three ounces, or with Viper Wine, with a Decoction of the leaves of Sage, of the root and seeds of the Burdock, and the Candied roots of Eringo, made of Spring-water, what will suffice, and boiled to one moiety; six or eight ounces in the Morning warm, expecting to sweat after it.

Take of Bezoartick Mineral Solar half an ounce, of Cloves powdered two drams; mingle them, make a Powder and divide it into twelve parts, let one be taken after the same manner, twice in a day; between these kind of Remedies, gentle purging may be often used.

Take of the Powder of the picked roots of Zedoary, the lesser Galingal, each half a dram; of Species Diambre one dram, of the Powder of the seeds of Mustard, Rocket, Scurvygrass, Water-Cresses, each half a dram; make of them all a fine Powder, add to it of the Oyl of the purest Amber half a dram, and with white Sugar dissolved in the compounded Pæony water, and boiled up to the consistency of Lozenges six ounces: make Lozenges according to art, weighing each half a dram: Eat of them three or four twice in a day, drinking after every Dose, of the liquors before mentioned.

Take of the Powder of Virginian Snakeweed two drams, of the lesser Galingal one dram, of the gummed extract of the remains of the distillation of the Elixir Vita of Quercitan two drams, of the Flowers of Sal Armoniack, (or the most pure Volatile Salt of Sul or Harts-horn) one dram, of the Balsom of Peru one scruple, of the Balsom of Capivus what will suffice to make a mass; let it be made into small Pills involved in the Species Diambre. The Dose is half a dram evening or morning.

Take of the Resine or Gum of Guaicum three drams, of the Species Diambre one dram, of the Chymical Oyl of Guaicum rightly rectified one dram and a half, of liquid Amber what will suffice to make a mass; let it be formed into Pills, to be taken after the same manner.

If that the Palsie happens in a Cholerick temper, or to a young Man, it admits only of milder Medicines, and all the more hot things, and Elastick, do but imberter the Disease: The following forms are in use, for the taking away of its foregoing cause.

Take of the Conserves of the Flowers of Betony, of Fumitory, of Primroses, each two ounces; of the Species Diambre one dram, of Ivory, Crabs Eyes, and Claws, each four scruples; of the Powder of the Flowers of Pæony two drams, of Lignum Aloes, of yellow Sanders, each one dram; of the Salt of Wormwood one dram and a half, and with the Syrup of the Flowers of Pæony what will suffice, make an Electuary. The Dose is two drams twice in a day, drinking after it, either the simple water of the Flowers of Aron, or of the following Compounded Water three ounces, or of the Decoction of Sage, with the leaves of Tea infused in it four or six ounces.

Take of the Roots of Aron or Cuckopint, of the male Pæony, Angelica, Imperatoria, each half a pound; of the Flowers of Sage, Rosemary, Marjoram, Brooklime, Water-Cresses, each four handfuls; of the rinds of six Oranges, and four Lemons, of Primroses, Cowslips, Marigold flowers, each three handfuls; let them be all bruised and cut, and pour to them of new Milk six pints, of Malaga Wine one quart; distil them in common Stills, and let the whole liquor be mixed together.

Sometimes instead of the Electuary may be taken between whiles, for fourteen or fifteen days, of the Syrup of Steel, of which let one spoonful be taken in three ounces of the distilled Water: It may be made after this manner.

Take of the whitest Sugar dissolved in black Cherry Water, and boild up to a consistency, eight ounces, adding to it of our Steel in Powder three drams; let them be stirred together over the fire, and then by degrees pour to it of the Water of Rosemary warm twelve ounces; let it boil gently for a quarter of an hour, scumming it, and pouring it forth warm thorow an hair sieve or strainer.

There may be also made steeled Lozenges after this manner, to wit, with Sugar sufficiently boiled with Steel, adding of the Chymical Oyl of Amber or of Rosemary half a dram, and presently let it be poured forth that it may flow into a consistency of Lozenges: The Dose is two drams twice in a day, drinking after it of distilled Water, or of the following Apozem six ounces.

A Decoction.

Take of China Root one ounce, of the shavings of Ivory, Harts-horn, each half an ounce; of white and yellow Sanders, of the Wood of the Mastick-tree, each half an ounce; let them be infused in warm water and close stopd for a whole night, six pints; in the morning add to them of the Roots of Chervil, of sweet smelling Asens, of Broom, and Parsley, each one ounce and a half; of the dried leaves of ground Ivy, Sage, Germander, Betony, each one handful, of Coriander seeds three drams; let them be boiled till half is consumed, then add to it of white Wine half a pint, and strain it into a jagg, upon the leaves of Water-Cresses bruised two handful; Let it infuse warm and close shut, for two hours, strain it again, and keep it in a close Vessel well stopd.

In the Scorbutick Palsie, the Juices and expressions of Herbs, do often bring notable help.

The juice and expressions of Herbs.

Take of the leaves of Brooklime, Water-Cresses, and Plantain fresh gathered, each four handfuls, bruise them together, and pour to them of the distilled Water but now described eight ounces, squeeze the juice strongly forth, and keep it in a glasi, and take of it twice or thrice in a day three or four ounces.

At the extreame Physical hours, viz. Morning and Evening, may be taken these following Pills.

Pills.

Take of Millipedes prepared three drams and a half, of Pearls one dram and a half, of the Root of the Cretick Dittany one dram, Venice Turpentine what will suffice to make a mass: let it be formed into small Pills, the Dose is half a dram, drinking after it a draught of the distilled Water.

For ordinary drink, let there be prescribed, either a Bochet of Sarfe, China, yellow Sanders, &c. or small Ale, with the dried leaves of ground Ivy, boiled in it; and of Sage, with the Wood of Sassafras, infused therein.

2. Whilst these things are doing, for the taking away the foregoing cause of the Disease, there is no less a curatory care required, for its conjunct cause; to wit, that all obstructed places being opened, they might admit the Animal Spirits, free from stupefaction, and that they may pass freely thorow.

Thick and particular Remedies.

There are two chief kinds of Remedies, which conduce to those ends, viz. one particular and private, to be applied to the distemper'd places: to wit, that by Fomentations, Oyntments, Plasters, and such like outward applications, the sleepy Spirits might be awakned, and their passages opened: the other universal, to wit, that the Blood and Spirits, and the other humors (and the active Particles flowing in the whole Body) being very much agitated, and put into a rapid motion, like a torrent, they might cast down and remove all impacted heaps or stays, by which the Spirits are obstructed.

The administrations used to the distempered parts are so ordinarily and commonly known, that it were superfluous to insist here on the describing them more largely. First Liniments, made out of Oyls, Oyntments, and Balsoms, are to be applied according to the temper of the Patient, more or less hot, and with frictions or strong rubbing twice a day. Sometimes, before these are made use of, Fomentations made of Cephalick Herbs, or spices boiled in Spring Water, adding to it sometimes Strong Waters, Wine, or Bear or their Lees. Further, sometimes it is convenient to make about the distemper'd places Blisters, and to use Cupping-glasses, and Medicines to take away the hairs, and to raise pimples. Little Bags and Plasters often help. Moreover, if the business will admit it, let the Paralytick members be covered over with hot

hot grains, or with the refuse of the Grapes when sung out of the Wine-press; or let them be thrust into the belly of a Beast new slain, or bathed in an artificial Bath, or in the natural Baths, and be kept for a long while in any of these.

But if these help not, you must then come to universal Remedies, or great Remedies; of which sort, in the first place, are *Diaphoreticks*, or sweating Medicines, *Mercurial Medicines* stirring up Salivation; and strong Vomiting Medicines: of each of which we shall speak briefly. Universal Remedies.

In the Cure of the Palsie, sometimes *Diaphoreticks*, or Medicines causing sweats, do very much help; and that they sometimes are hurtful, the common people do ordinarily observe. Wherefore it is very requisite, that we should unfold the reasons of this so different effect; and that so indications may be taken as to the use or rejection of them. 1. Diaphoreticks.

Therefore, a plentiful sweating is wont to be helpful sometimes to *Paralyticks*, chiefly for two reasons; to wit, for that it doth thrust forth or exterminate in a great measure the impurities of the Blood, and the nervous juice, being apt to breath forth; so that the Morbific matter doth not flow any more to the Brain, and the distemper'd parts; and that whatever hath already flowed forth from them, is partly conveyed forth of doors. Then, Secondly, Because the Effluvia's of heat falling away from the boiling blood, do very much open the nervous Passages before obstructed; whilst in evaporating they pass thorow them, and make an open way for the Spirits. Wherefore this administration is chiefly and almost only convenient for those, whose Blood is not stuffed with fixed Salt and Sulphur, but is diluted with a limpid and saltless Serum. For on the contrary, *Paralyticks* whose blood and humors are full of fierce, Exotick, and fixed Particles of enormous Salts and Sulphur, and unfit to be exhaled, do often receive great harm by a violent and forced sweating. Of this kind of effect we have assigned these two causes, to wit, because that the Morbific Particles, by reason of agitation being too much exalted, become more outrageous; then secondly, because these being more plentifully brought to the Brain and nervous Stock, they oftentimes increase the old obstructions, and not rarely produce new.

They are not to be administered indifferently to all.

They often hurt the Choleric.

That a plentiful sweating or *Diaphoresis* may be easily provoked, both internal Medicines, and outward administrations are wont to be made use of. The former stir up either the Blood or Serum into an heat, or provoke the heart into more swift motions; and for that cause (whether one or both be done) when the bloody liquor is rapidly circulated thorow the Heart and Vessels, and is wrought into a frothy swelling up, there is a necessity, that very many Effluvia's, which are the matter of sweat, should go away from it. For this end, Medicines of a various kind are commended to *Paralyticks*, of which the most noted are, a Decoction of *Guaicum*, *Sarsaparilla*, &c. Sweating Medicines.

Spirits and Oyl of *Guaicum*, the simple mixture, Flowers and Spirits of *Sal Armoniack*, *Aurum Diaphoreticum*, the Salt of *Vipers*, as also the Powder and Wine of the same: the Solar *Rezoartick minerale*, Tincture of *Antimony*, &c. External administrations move sweat, because they hold in, and stir up the moderate heat in the whole body; and so the blood being made hot, is compelled to move more swiftly, and to evaporate more, and at the same time, the Pores of the skin, being unlocked, readily let forth all the Particles that are apt to exhale. For this use, besides the Bed-cloaths (which only hold in the Effluvia's of heat sent from the body, about it still) there are little sweating Chairs, or Stoves, made hot with Coals or with the Spirits of Wine: also Hot-houses and Baths of various kinds and forms, and our natural Baths, are wont to be made use of: But of all of them, our natural Baths of the Bath (if they agree with the temper of the sick) are thought to be the best Remedy; which the many Crutches, hung up as so many trophies of this Disease being overcome, belonging to many Cured of the Palsie, do sufficiently shew.

Stoves, Baths, Natural Baths.

But as the best Medicines, if they prove not a Remedy to the Disease, often pass into poisons; so the use of Baths, when it cures not some *Paralyticks*, renders them much worse; so that when as the sick had before many members distemper'd and resolved or loosened, there was no other occasion for them of leaving behind them there their Crutches, unless it were because they could use them no longer. We have above shewed the cause of this; to wit, because bathing, shaking, or moving the blood, and all the humors, more exalts all the Morbific and extraneous particles, and they becoming more outrageous, drives them from the Viscera into the bloody mass, from whence (when they cannot easily evaporate) entring into the Brain and nervous Stock, increase the *Paralytick* Distemper, and very often adds to it the Convulsive. For this reason Bathing sometimes actuates or stirs up the *Nephritic*, and the Gouty disposition; and further, in many where there was not a disposition, it causes a spitting of blood, the *Asthma*, or Consumption. Wherefore Baths ought not to be tryed without

When the use of Baths is hurtful in the Palsie.

without the advice of a *Physician*, and then having tryed them, if they seem not agreeable, they are to be soon left.

Salivation. I have by my own experience sufficiently try'd, and known also by that of several other *Physicians*, that some *Paralyticks* have been cured by Salivation excited by *Mercury*. But I think this kind of Remedy, is only to be used to the habitual *Palsie*, to wit, which hath its foregoing cause in the Blood and Brain, easily moveable, and its conjunct cause, in the nervous appendix, not very fixed. But when this Distemper is caused from an outward and great hurt, or follows upon the *Carus*, *Apoplexy*, or *Convulsions*, a Salivation or spitting is attempted in vain, and sometimes not without great hurt. But whoever are indued with a weak and too loose a Brain, and are obnoxious to frequent Convulsive motions, are not rashly to make use of *Mercury*. Yet sometimes a Salivation in an habitual *Palsie*, and not very fixed, hath highly profited, forasmuch as by taking away the impurities of the blood, it cuts off all the nourishment of the Disease; also, because some *Mercurial* Particles, whilst passing thorow the Brain, and entring the nervous passages, divide the Morbific matter impacted in them, and drawing its parts one from another, variously disperse some forward, and others backwards; when oftentimes it is the fault of other Medicines, that they only urge forward the heap obstructing the ways of the Spirits, so that if they pull it not to pieces, they drive it more firmly into the obstructed places.

Vomitories. In some measure it is for this reason also, that Vomits do frequently yield notable help in the Cure of the *Palsie*, to wit, because they draw away the nourishment of the conjunct cause, yea and do not always drive forward, but pull back the matter impacted in the Nerves, do greatly shake, and often break it in bits; so that when the continuity of the heap is broken, the Animal Spirits themselves easily dissipate the Particles of the Morbific matter, loosened one from another. We have before mentioned another reason of the help of *Emeticks* in the Sleepy Disease, which also may have a place in the *Palsie*.

Histories and Examples of Paralyticks. Instances and examples of *Paralyticks* are so ordinarily and almost daily met with, that their various Types and Histories would fill a Volume, if they should be described. Wherefore I shall only add here some few and more rare ones, to wit, one or two, by which the chief kinds of this Disease may be illustrated. For as it will be little to the purpose, to describe the resolutions of members, excited by outward accident, as from a fall, wound, or stroke; I shall insist only on those cases, where the *Palsie* either arises by its self, after a previous disposition, or comes upon some other Disease.

The Example of the Palsie habitual excited of its self.
The first History. Some time since, a certain Gentleman, strong, and well flesh'd, and beyond the tenth lustre of his age, almost ever healthful; at length being given to a sedentary and idle life, and from thence becoming more dull and heavy than usual, refused any exercise, and more hard motion of the body: moreover he was wont to be melancholick and sad, upon any light occasion, yea sometimes to break forth into weeping and tears, without any manifest occasion. This man a little after (which I also observed in many others) was distemper'd with an imbecillity and trembling of all his members, and then with a resolution of the lower parts; to which Disease (for that he was melancholick, and soon weary of Medicines) he gave himself up as overcome, and by degrees being made more weak and languishing, he dyed within six months.

I remember many others, but especially two committed to our Cure, who were highly ingenious and very learned, in the former part of their life; but afterwards in their declining age, partly through the evil disposition of the body, and partly through the perturbation of the mind, became dull and forgetful, and after that (notwithstanding the use of the Remedies in the beginning of the Disease) *Paralytick*.

The Reason of it. In these kind of cases, first the Brain it self, as to its temper and make, seems to be so weakened; that the Spirits inhabiting it, becoming torpid, and wandering out of their tracts, did not rightly perform the acts of Memory and Imagination; then by reason of their failure and disorders in their first spring or fount, (which are not enough taken notice of till they become uncureable) there is a necessity, that an impotency or an eclipse of the motive faculty, should succeed in the nervous appendix. But the Cure of these Distempers, as often as they are excited from such an occasion, is ever very difficult, because the antecedent cause is hardly or scarce ever taken away.

The second History more rare and notable. A young man, of a Sanguine temper, ingenious, and for the most part healthy, sitting in a Chair after a large supper, and immoderate drinking of Wine, was so distemper'd with a numbness or stupidity in his right hand, that his Gloves which he held in it, fell of themselves out of his hand; then getting up, and endeavouring to walk, he felt a resolution or loosening in his Thigh and Leg of the same side, and a little

a little afterwards falling into a certain hebetude or dulness of mind, and stupefaction, yet without an *Apoplexy*; for he was still himself, answering aptly to questions asked him, though but slowly and with difficulty, and doing those things that were bid him. Presently a skilful *Physician* being sent for, *Phlebotomy*, Vomiting, and Purgings, were celebrated in order, Cupping-Glasses, Scarification, Oynments, Frictions, and other fit administrations were carefully applied: Nevertheless the *Palsie* increased; that besides the motion of his members on the right side being taken away, he also lost the sight of that eye; yet still being stupefied and sleepey, he was *compos mentis*, and knew his Friends, and being conscious of his infirmity, and solicitous for the recovering his health, he took all remedies were given him; but notwithstanding all this, the animal functions daily more and more languished, and at length by their consent the vital; so that about the seventh or the eighth day, from thence, falling sometimes into a Delirium, and sometimes into Convulsions, or other distractions of the Animal Spirits, his strength being at length quite lost, he yielded to Death.

His Head being opened, the anterior cavity of the Brain was filled, partly with ichorous Blood, partly concreted and in clodders or gobbets, with plenty of Serum: Hence, as it is easie to conceive, from this deluge, pressing upon one of the Streaked bodies, and binding up its Pores and Passages, the flowing of the Spirits into the nervous appendix of that side was hindered, and for that reason, the resolution in the respective members was excited; and because of the *optick* chamber, where it is inserted into the Streaked Body, being also pressed together, the Eye of that side lost its sight; further, because the *Callous* Body, chambring that den, was somewhat pressed by the heaped matter, from thence the hebetude and stupefaction of the chief functions of the soul were excited, yet without their subversion or inordination: By reason of the evil being fixed on the substance of the Brain, and the Spirits inhabiting it, these sorts of Distempers do proceed, and not from the impletion of the Ventricle, as appears clear enough by this instance, and by what we have elsewhere mentioned.

An Anatomical Observation, which the Case is explained.

A Servant to a certain Nobleman, being about forty years of Age, indued with a sharp Blood, and Cholerick temperament, and for some time obnoxious to the *Vertigo*, whilst he was riding in the Country to a certain Village, being taken suddenly with a dizziness in the Head, he fell upon the ground headlong, and being instantly taken up by the inhabitants, and put to bed, he lay for many hours insensible, and as if dead. But afterward being awakened, he felt an universal *Palsie*, and all his members loosened on both sides. Visiting this Man the day after, I took from him presently about twelve ounces of Blood, and prescribed forthwith some other Remedies, both outward administrations and also inward Medicines to be carefully given him, and indeed with good success; for after five or six days, he began to bend and stretch forth his hands, and feet, yea, though slowly, to move them about hither and thither; then by the constant use of Remedies, within two months, he was able to rise up, to stand on his feet, and to walk a little with the help of Crutches; then using at home for some time daily a temperate artificial Bath, he got strength and motion by degrees in his members; at length as soon as the season of the year served, going to the Bath, within a fortnights time, by the use of the Baths, he grew perfectly well, and leaving his Crutches behind him returned whole.

The third History.

In this case, the *Apoplectick* matter falling down out of the middle of the Brain, being divided and largely poured forth, entered both the Streaked Bodies, and so caused the universal *Palsie*; but forasmuch as being more stretched abroad, the same was the less thickly impacted in the Marrowy Pores, therefore being more moveable, and apt to be shaken off, it did admit so easie and quick a Cure. To this man the more hot Remedies were not agreeable, so that I was compelled sometimes to iterate *Phlebotomy*, and to give him only temperate Medicines. That the *Palsie* doth sometimes succeed, not only *Cephalick* Distempers, but also the *Colick*, and *Scurvey*, (as we have already hinted) the following History, (of which we have somewhere made mention as to its *Scorbutick* reason,) will manifestly declare.

The Reason of this.

A young and handsome Woman, after being brought to bed, fell into a Tertian *Feaver*, this coming at length daily upon her, and protracted, brought in a most cruel and continual *Colick*. The pains at first tormented her only in her Belly, with vomiting and most sharp torments. Being a long while vexed with these, and almost worn out; at length she began to be molested with a stupefaction, and a sense of tingling, such as comes upon a member laid upon. Nor was it long after that but a *Palsie* (which this other Distemper very often foreruns) follow'd in her whole Body. In this condition being brought to Oxford, she was committed to our Cure (the noted *Physician* Dr. *Lydel* being also called to our assistance.) In this sick Gentlewoman, not only all her greater Members, as her Arms and Legs, but almost every

The fourth History.

lesser

lesser joynt or limb, was almost wholly loosened, that she could not move hand nor foot, or the fingers or toes of either. Further, she was so distemper'd with a wasting away, that she was nothing but skin and bones, however (and from which only we had any hopes) she had a good Pulse, and a lively aspect.

The Cure expos-
posed.

After we had administer'd to her for many weeks, most choice Medicines, both *Antiparalytick* and *Antiscorbutick*, almost of every kind, and according to the various methods, without any success; at length we proposed to her, and to her Friends, *Salivation*, as the most powerful, though also most dangerous of all other Remedies; they not long deliberating upon it, resolve to try a Medicine rather doubtful than none, and though the same should be wholly inefficacious. Therefore by God's help, we gave her in a small Dose, precipitate of *Mercury cum sole*, and the next day repeated it. On the third day, a moderate and easie Salivation beginning, gently succeeded for a week, without any malignant symptom; but then the sick complaining of a grievous Headach, and *Vertigo*, began to be afflicted with Convulsive motions; so that there was a necessity to let her lye down, and depress the Salivation, and as soon as we could, to break off this course, by the Serous Flux of water being called away from the Head, to the other parts; which indeed Clysters, frequently given, *Epispastick* or drawing and revulsive Plasters, applied to several places, together with Cordials and Opiates inwardly given her, did quickly effect; and then presently this Gentlewoman finding her self a little better, began to stretch forth and bend her fingers and toes, and sometimes to move her members from one place to another. Her spitting ceasing, being gently purged, she took for many days a Decoction of *China*, *Sarsa*, *Saunders*, *Ivory*, &c. with the addition of the dried leaves of Betony, Sage, female Betony, &c. and between whiles with that, Spirits of Harts-horn, or of *Sut*, *Cephalick* and *Cardiack* Confections, also Powders and proper *Juleps*. Within a months space, being held up by her Servants, she could stand on her feet, and walk a little in her Chamber; moreover, sleeping and eating moderately, she every day got flesh and strength, and at length by the use of the temperate Bathes at the Bath, she grew well.

The Reason of it.

The reason of the aforesaid case seems to be after this manner: First, the vitious blood had contracted an intermitting Feavour, then by reason of the long stay of that Feavour, the same being made more vitious, did also impart its evil to the Brain and nervous Stock; the matter being poured forth from the blood on them, together with the nervous juice, being only at first *Spasmodick* or Convulsive, and entering much into the *Intercostal* Nerves, excited the *Colick*; but then, that being more largely poured forth into the Nerves of the *spinal* Marrow, brought on painful contractions in the nervous Fibres, in almost the whole habit of the Body; and when from the assiduous and plentiful incourse of the Convulsive matter, the passages of the Brain and Nerves being very much unlock'd, became very open, at length the more thick and *vitriolick* Particles entering with them, disseminated the *Paralytick* Distemper thorow the whole Body. Concerning its Cure, the Remedies used before Salivation did not profit, because they urging this Morbific matter still forward, drove it more deeply and closely into the nervous passages; but the *mercurial* Particles, because they dissolved the matter so compacted, first opened the way of Cure, which afterwards being much helped daily by *Cephalick* Medicines, it was at length consummated by the use of the Baths.

The fifth History,
showing
when the Baths
are hurtful.

But that Baths are not profitable to all *Paralyticks*, yea (as we said above) very hurtful to some, this following History (whose mournful catastrophe happened whilst we were writing these) will manifestly declare. A Merchant of London having put his foot out of joint, became upon it lame in that part, but as to all things else he was sound and strong enough; when he had tried for some time several kinds of *Topick* Remedies, and they effecting nothing; at length, by the counsel of a *Physician*, going to the Bath, he began to try the temperate Baths, by the use of which growing presently worse, and beginning immediately to have a Palsie in his other Members, he had abstained from them, but that the *Physician*, then present, promising him that he should afterwards be better, exhorted him to persist; wherefore he again enter'd into the Bath, for about thirty days, until at length all his lower members, to wit, from the *Os sacrum* to his Feet, being wholly loosened, withered away; besides in his Breast was excited a very great difficulty of breathing, and as it were *Asthmatical*. For that his breast was not able to be dilated sufficiently, by introducing the breath deeply, the Muscles dedicated to respiration being as it seems also affected with the Palsie; wherefore growing short-winded, he laboured with a continual endeavour of those parts, and with an agitation of the whole *Thorax*. In this condition leaving the Bath, he was bid by his *Physician*, to abstain for a whole month from any Remedies taken from

from Medicine; which when he had strictly observed, out of hope to grow well again, that time being elapsed, it was then too late to deliberate on the use of any Medicines; for besides his *Paralytick* and withered members, his belly swell'd, his breathing was yet more hard and troublesome, that he could now scarcely draw breath: His Pulse was very weak, and upon any motion of his Body, he had frequent swoonings away, and loss of Spirits: Hence, as there was scarce any place left for purging, Cordials and Antiparalytick Remedies were only to be insisted on, but notwithstanding the use of which, this sick man, within a fortnights time, labouring for many hours under a *Dyspnoe* or want of breath, at length expired. The immediate cause of whose Death I suspect to have been the manifold concretions of the blood in the Heart; for when the motion of the *Præcordia* for a long time was very much hindered, there seems nothing more probable, than that these kind of gobbets as it were fleshy, should increase within the Ventracles of the Heart.

For the illustrating of the *Theory* of the *Palsie*, a little more, and also of the *Lethargy* and *Coma*, I shall add this other example, with *Anatomical* observations; which happened whilst the former were in the Press.

A little one a little above three years old, of a moist or humid Brain, as appeared by most grievous sore Eyes, and the watry wheelks or pustles of the face, to which it was sometimes obnoxious; falling ill about the beginning of *Autumn*, with a slow Feavour, and lost Appetite, it became very torpid and sleepy, so that it would sleep almost continually day and night; but being awake, he knew those standing about him, and answered very aptly to their Questions. To this Child, fit Remedies being presently and diligently given, *viz.* Clysters, Blistering Plasters, Purges, also Juleps, Spirits of Harts-horn, Powders, with many others used in these cases, they prevailed so much, that within six or seven days the sick Child being free from its Feavour, waking enough, and desiring Food, seemed to grow well, and to have scarce any more need of a *Physician*: But in a short time after (by what occasion uncertain) falling into a relapse, and again sleepy, was presently seized with a most grievous stupefaction, so that it was hardly to be awakened; and scarce knew any one, or what it did it self; the next day being plainly stupid, though being strongly pulled; it did open its Eyes, it would roll them about hither and thither, and saw nothing; but within a day or two, a *Palsie* follow'd in its whole right side. The former Remedies were repeated, and besides sneezing Medicines, chewing Medicines to draw down Rheum by the mouth, a taking away of Blood, with Poultisses applied to the Feet, and all its Head being shaven, drawing Plasters were put all over its Head, with other Medicines; and ways of administrations prescribed in order, nothing profited; but that this sick Child, after its lying so insensible for four or five days, at length its breath and Pulse failing, dyed.

An Example of the Palsie from a Lethargy.

Its dead Body being opened, we found almost all things sound enough in the lower and middle bellies, (*i. e.* in the Belly and Breast) unless that in the right Kidney, a whitish mattery Humor, or as it were a thin Corruption, had begun to be heaped together, which plentifully flowed forth out of some parts of the Kidney being dissected and squeezed together: This did seem to have been the beginning, or a certain rudiment of a future Imposthum, and perhaps by reason of the Serum not sufficiently separated here, its greater plenty had flowed to the Brain.

For the top of the Skull being taken away, the anterior region of the Head, almost to the insertion of the fourth bosom, swelled up, being covered with clear water, shining thorow the Membranes, which presently flowed forth, when the *Meninges* were dissected: Further, in this place, portions of the Brain being by pieces cut off, appeared too wet, and without any red or bloody pricks: but in the hinder border of the Brain the Vessels were red with blood, and the *Cortical* substance appeared without tumor, or deluge of water, more close and firm: From these (as we have affirmed before) it manifestly appeared, that the cause of the *Lethargy* did depend upon the watry flood, or as it were *Anasarca* or Dropsie of the outward part of the Brain.

The Brain being cut piece-meal, and an hole made in the anterior cavity, distended by the water, the clear water being before as it were penned up; within a more narrow space, leaped forth, a great plenty of which had filled all the Ventracles to the top, and (as it seems) by compressing the *Optick* chambers, (as in the other case above described) brought in blindness, and by entring or pressing together one of the Streaked Bodies, or its Pores, caused the *Palsie*.

The *Chorooidal* Infoldings appeared as it were half boiled, whitish, and almost without blood. It is probable, that the water did flow forth of these Vessels, by which the Ventracles of the Brain were overflowed, all, or at least the greatest part

of it; although in this case, if (as some think) the watry *Latex* or Humor sliding down lower from the shelly part of the Brain, the Brain being at length thorowly passed thorow, did rain down into these bosoms, we may from thence aptly fetch a reason, wherefore the *Lethargy* at first thought to be cured, returned afterwards more cruel, accompanied with blindness and the *Palsie*; to wit, because at first the stock of the sleepy matter falling down, from the shelly part of the Brain, into its cavity, the animal function was a little cleared; but afterwards, when new matter sprung up in the *Cortex* of the Brain, and this sliding forward into its bosom, was heaped up to a fulness, for that reason happened the relapse of the former Disease, with those companions of blindness and the *Palsie*.

But although the Dropsie of the interior Brain, or the inundation of its Ventricles, by compressing either the Streaked Bodies, or the *oprick* chambers, raised up the *Palsie* or blindness, or by pulling the beginnings of the Nerves, the Convulsive Distempers; yet it appears most evidently by our late *Anatomical* observation, that the *Lethargy* did not arise from any such cause, but only from the exterior part of the Brain being overflowed, or pressed together.

A certain Gentleman a long time unhealthy, after he had laboured almost for five months with the *Colick*, or rather with a wandering *Scorbutical* Gout, in which not only the Viscera and Loins were troubled with great torments; but moreover the Membranes and Muscles of the whole Body, were almost continually tormented; and at length he suffered sometimes most horrid Convulsions in his Members, sometimes resolutions, and sometimes a Phrensie in his Head, and sometimes as it were *Apoplethical* fits, or a darkness in his Eyes, so that being worn out, his strength and spirits wholly exhausted, he dyed. Almost seven days (except the last but one) before he dyed, being more strong as to his Sense and Intellect, he lived almost perpetually without sleep; though gentle or the more strong *Opiates* were given him, yet he could not sleep at all. A little before this waking, from a *Vesicatory* applied to the hinder part of his Neck, an immense quantity of water flowed; and from that time even till he dyed, it still flowed forth; hence, as I suspect, he became so waking by reason of the watry humor being so greatly drawn away from the Brain.

The head of this dead Man being opened, the interior cavities of the Brain, or all the Ventricles being filled to the top with clear water, appeared as if they were distended; yea the medullary cord it self, about the top of the Back-bone, seemed to be drowned and compassed about with water laid up there. Without doubt, for this reason, the Pains and Convulsions so cruelly tormented him in his Loins, Members, and all over his Body; and by reason of the deluge in the Ventricles, he became obnoxious to blindness of his sight, and to frequent loosening of his limbs: Nevertheless, hence no *Lethargy*, but a waking was induced, by reason of the waters being so much derived from the compass of the Brain by the Blistering Plasters. He had also a Dropsie in his Breast, by reason of his Lungs being much vitiated. His Liver appeared of a mighty bulk, besprinkled every where with white spots, and almost without blood: so that to these faults of the *Viscera*, the vices of the Blood and nervous juice ought in some measure to be ascribed.

C H A P. X.

Of the Delirium and Phrensie.

THUS much concerning *Cephalick* Diseases, by which the Animal Functions by themselves, and as they are Corporeal, without any respect to the Animal Soul, are wont to be hindered or perverted: In some of which, viz. the *Ver-tigo* and *Palsie*, the Intellect for the most part remains clear and lively, and in the rest, like the eye placed in an obscure place, it beholds the species, either not at all, or a few objects only of a more rude appearance, but is not easily snatched into any great error or fury; which kind of *symptoms* are ordinarily induced by reason of other Distempers of the Head, and of the Spirits inhabiting it, of which we are now about to treat. For if at any time the Imagination is so disturbed, or perverted, that it falsely conceives, or evilly composes or divides, the species and notions brought from the Sense or Memory; presently for that reason the intellect beholds or forms conceptions and thoughts only deformed, distracted one from another, and very confused: Which indeed are represented to it from the Brain evilly affected, and as it were monsters from a multiplying or distorted Glass. As there are many ways, by which the Imagination, and by consequence the mind and will, and the other powers of the superior soul, are wont to be perverted or depraved, all of them are noted by the common word Foolishness, or talking idly. But this Distemper is distinguished into shorter, which is called a *Delirium*; and into a longer or continual; which is either conjoined with a Feavour, and termed *Phrensie*; or it happens without a Feavour, and then their is joyned with it, either raving, sadness, or stupidity, and so it is divided into madness, melancholy, and morosity or foolishness: we shall speak of each of these in order; and first of the *Delirium* and *Phrensie*.

The Distemper of the Brain follow, in which Reason is hurt as well as the other Animal Functions.

who are said to be Foolish, or to talk idly.

This is either shorter, as the *Delirium*; or longer, and with a Feavour, & called *Phrensie*; or without a Feavour, as melancholy, madness, stupidity.

Although the *Delirium* is not a Disease of it self, but only a *symptom* proceeding from other Distempers, yet because it happens in some of them, that for the most part it is cured by Remedies appropriate to it, therefore it will not be amiss for us to inquire a little more strictly into the causes and nature of it. This word taken after an especial manner, is the same with *μεγεσυν*, or a going crooked, or out of the right or straight way, and denotes an hurt of the same Animal Function such as ariseth in fits of the Feavour, Drunkenness, and sometimes in the passions called *Hysterical*, and induces men for a short time to think, speak, or do absurd things, either some of these, or all of them together.

What the *Delirium* is.

The *Delirium* is excited, forasmuch as the Animal Spirits being either too much irritated, or acted into confusion, are carried tumultuously into disorders hither and thither, within the globous compass of the Brain, where the *Phantasie* and *Memory* have their seats; and so whilst the various images of the imagination and the memory being excited at once, are confounded together, they object only incongruous and absurd *phantasies* to the rational Soul, and so both the acts of the intellect and the will, are only inordinately chosen or drawn forth. In like manner it happens, by reason that the Animal Spirits being moved, within the middle of the Brain or the *Callous* Body, that incongruous conceptions, and confused thoughts, are objected to the rational Soul; as in a long circumgyration or turning about of the body, the images of visible things are carried to the common sense, whence all things seem to be turned about, and sometimes to be lifted up, and sometimes to be depressed to the ground; that nothing is beheld stable or standing in its due place, and position. In a Brain rightly disposed, the motion of the Animal Spirits are performed, as it were in certain numbers, ways and measures; whilst some Spirits are raised up in these tracts, others lye still in those, and so they succeed one another in their motions; and the several acts of every faculty are made distinct, like so many wavings of water in a River; but in the *Delirium*, all the Spirits leap forth at once, and meeting one another tumultuously, or variously laying hold on one another, are agitated like mad *Bacchanals*. Further, even as these being struck with such a fury within the compass of the Brain, do stir up manifold and very much disturbed cogitations; so whilst they are carried without its confines into the nervous original, they produce incongruous speeches, absurd gestures of the body, and members, and not rarely Convulsive motions. But for that such a rage of the spirits, (otherwise than in the *Phrensie* or *Madness*) presently grows cool, and their tumult being over, none of their wandering tracts are imprinted in the Brain, the *Delirium* soon passes

its formal Reason.

over, and the distemper'd come immediately to themselves again, without any marks left of their foolishness or idle raving.

If it be demanded, from whence this short fury is impressed on the Spirits, inhabiting the Brain, that the Reins of the mind being shaken off, they turn thus all things upside down in their government; we say, that they conceive this kind of inordination, from a twofold reason; to wit, this rage or madness is brought immediately to them, from the blood washing the frame of the Brain; or some Animal Spirits, outwardly dwelling in the nervous Stock, enter first of all into some disorder; then the same being communicated by the nervous passages, affecting in like manner the spirits there inhabiting, stirs them into a *Delirium*. There are various causes and kinds of either of these: the chief of which we shall here touch upon; and first shall be shewed, how, and for what occasions, the Blood, being either swelled up with too much heat, or being pregnant with an invenomed matter, is the parent of the *Delirium*; forasmuch as it insinuates into the Pores and passages of the Brain, either fierce and untameable particles, or such as are malignant and deadly to the Animal regiment.

The Causes of the Delirium.

1. Either from the Blood: Or

2. From exterior Spirits planted in the nervous Stock.

By what, and how many ways the Delirium is caused by the Blood:

1. By reason of its too great heat.

2. By reason of untameable Particles carried from it into the Brain.

3. By reason of malignant Particles suffused from it.

4. By reason of Effluvia, or venomous Particles, obtruded also on the Brain.

5. By reason of its afflux being denied to the Brain.

First, As to the first, in the fits of intermitting and in the height of continual Feavours, the blood growing hot, by an immoderate burning, sometimes stirs up the *Delirium*, by the mere force of its Ebullition or boiling up; to wit, for that it swelling up very much, whilst it passes thorow the small shoots of the Arteries, every where diffused thorow the outward compass of the Brain, it very much blows them up and distends them; and so pressing together the substance of the Brain, variously drives in the Spirits, and as it were compells them into very confused troops: Moreover, from the blood so swelling up, with a frothy rarefaction, the Effluvia's of heat, and with them heterogeneous particles, entering into the Pores and passages of the Brain, agitate the Spirits, and tumultuously snatch them hither and thither.

Secondly, Almost for the like reason Drunkenness, a deep Sleep, or a *Delirium*, is brought in; to wit, forasmuch as the bloody mass doth insinuate the spirituous particles of the Wine, (by which it grows hot) into the Pores and passages of the Brain, by which the Spirits dwelling in them, are either plainly overturned, or are moved into inordinate and confused motions. For that the untameable little Bodies of Wine or Beer plentifully drunk, open the shut places of any Brain, how sound and firm soever it be, and penetrating deeply into the Marrowy passages, disturb and plainly overturn the Acts both of reason and of the imagination.

Thirdly, The blood suggesting not only feavourish and turgid, or vinous and untameable particles, but sometimes malignant, and as it were venomous to the Animal regiment, stirs up a *Delirium*, either with or without a Feavour. As to the former, in the Plague, Small Pox, malignant Feavours (although the heat be but moderate) the malignant matter being translated to the Brain, because it dissipates a great company of Spirits (rather than that it drives them into tumults) brings forth abrupt, incoherent, and at length distracted notions.

For the like reason also, some intoxicating and venomous things taken inwardly, and (as some affirm) outwardly applied, quickly cause a *Delirium*. This is commonly reported of the furious night-shade, *Mandrakes*, and some other plants; as for the roots of wild Parsnips, the thing is very well known. A certain intimate friend of mine told me, and he was a Man that might be credited, and also very learned, That he entering into the House of a certain Gentleman, found the Mistress of the Family, her Daughters, and all her Maids (excepting one) become all at once Delirious, and speaking absurd and incongruous speeches, run up and down and leaped about the House; and for that he plainly thought them all mad; he learnt of the sober Maid, who had her reason, and was her self, that all that had happened from their eating of Parsnips, which she had not tasted: Which indeed the event shewed to be true; for after they had tired themselves, and fallen to sleep, they all at length awakned sober. We have not here leisure to examine, whether this or other kinds of intoxicating things, infectious rather to the animal government, than the vital, do communicate to the Brain their evil, by the passage only of the Blood, or also in some measure, by a contact of the spirits residing in the Ventricle.

But moreover, we advertise you, that sometimes a *Delirium* is excited from a want, and great dissipation of the Animal Spirits; because their series or orders being broken off, and drawn one from another, like as if they were tumultuously heaped together, cause confused and incongruous notions. Hence it is observed, that some have become Delirious by great Hemorrhagies, or long watchings, and excessive want of Food; for this reason, many are wont to die delirious, and talking idly.

There remains the other kind of *Delirium*, in which the Blood being faultless, the Animal Spirits flowing some where in the nervous stock, first enter into disorder; then the same affection creeping thorow the nervous passages to the Brain, stirs up the Spirits inhabiting its middle part into a *Delirium*. This is sufficiently obvious in the passions that are called *Hysterical*; to wit, after a swelling up of the Belly, and an oppression of the Heart, doth succeed sometimes a lying speechless, sometimes a talking idly, with weeping and laughing. In like manner I have observed in a most cruel *Colick*, that sometimes after great torments about the Bowels and the Loins, they have fallen into a *Delirium*, then a little after this ceasing, the torments have returned. I knew a young Maid (as we have somewhere else mentioned) from the taking of an *Emericck* Potion, whilst it worked, was wont constantly to fall into a *Delirium*. I have also often noted, that a *Gangrene* beginning in some external member, has caused a *Delirium*. And this in a Wound or Ulcer, is ordinarily noted for a mortal sign; because it denotes the Animal Spirits in the distemper'd part to be slain.

How a *Delirium* proceeds from the irregularities of the exterior Spirits.

Nor doth this symptom coming upon those who are long sick and almost worn out, give any better prognostick; in the fits of intermitting Feavours, it is almost ever safe; but in continual Feavours dubious, and of something a suspected event; in malignant it more often fore-speaks evil; in Convulsive Diseases, the first assaults of a *Delirium* for the most part are free from danger, but yet its frequent coming, frequently turns that disposition into a *Come*, *Apoplexy*, or *Palsie*.

The Prognostick of a *Delirium*.

This Distemper, as often as it is seen to be safe enough, requires not a Cure, for the fit quickly and easily passes over: yet, because some, who have a loose and weak Brain, and the Animal Spirits too easily dissipable, and apt to flight and confusion; being disturbed by any light occasion, are wont presently to grow *Delirious* and to talk idly; therefore there is need of Medicine for these, not only of *Hellebore*, but also *Cephalick* Remedies, which may strengthen the Brain, and fortifie it against the incursions of the Morbific matter; also which may fortifie the Animal Spirits, and render them more fixt and strong for resisting. We have above described the forms of these kind of Medicines, and their manner of administration, which are profitable for the taking away the foregoing cause of any other *Cephalick* Distemper.

The Cure

A *Delirium* coming upon continual and malignant Feavours, requires a peculiar way of healing: for in the first place, it shews the morbific matter dangerously translated towards the Head, and therefore ought to be called back from thence, by any means; for which end may be laid Plasters that draw blisters to the hinder part of the Neck, other Plasters or Pultisses, or the flesh of living Creatures, or their warm bowels to the feet; inwardly may be taken temperate *Cephalicks*, as Powder of Coral and Pearl, black Cherry Water, or Water of Cowslip Flowers, or Poppy Water, and others sweetning and cherishing the Spirits.

These being thus premised, concerning the first and most light manner of foolishness or talking idly, we will proceed to its higher degree, viz. the *Phrensie*, which is far longer, and more durable, than the former Distemper. In the *Delirium*, a perturbation of the Spirits, inhabiting of the Brain, being excited, is like a waving of waters, from a stone slung into a River; but in a *Phrensie*, their commotion seems as it were the storm of waters, raging in a tempest.

The *Phrensie* is defined, to be a continual dotage, or deprivation of the principal faculties of the Brain, arising from an Inflammation of the *Meninges*, with a continual Feavour. To this Disease there is another of kin, viz. the *Paraphrensie*, commonly called, or additional *Phrensie*, whose cause is not an inflammation of the Membranes which cover the Head, but as they affirm of the *Diaphragma*. Further, in either Distemper (as also in the *Pleurisie* but falsely) it is affirmed, that the Feavour doth arise as it were only symptomatical, from the same conjunct cause, viz. from the Inflammation of some part. But indeed, that the *Phrensie* doth rather succeed the Feavour, and is produced, because the boiling blood doth transfer its dust or burnt recrements to the Head; *Hippocrates* long since, and now every common body, observes: to wit, for that the Urine of one sick of a Feavour, being changed from a troubled and thick, into a thin and waterish Urine, shews *Phrensie* at hand: Wherefore, from hence, the cause of this Distemper is concluded to be a translation of the Feavourish matter into the Brain.

Of the *Phrensie*, what it is.

The *Paraphrensie* is.

But as to the conjunct causes of the *Phrensie*, and *Paraphrensie*, we may easily shew, that the former doth not always proceed from the Inflammation of the *Meninges*, nor this latter from the Inflammation of the Midriff. I have often seen in Anatomical Dissections, the *Meninges*, yea sometimes also the exterior compass of the Brain,

Their Conjunct Causes.

Brain, beset with an inflamed tumor, and the sick not distemper'd with a *Phrensie*, but on the contrary with a stupidity, and have dyed with a *Carus*, or some other sleepy Diseases. And truly, that it is so, reason plainly declares; for the *Meninges* being inflamed, and by that made more tumid, press together the Brain very much, and about its compass shut up the ways and passages of the Spirits; so that the functions of waking and memory being hindred, the *Lethargy* (as it appears *de facto*) necessarily follows: Notwithstanding, far otherways in the *Phrensie*, all the passages and Pores of the Brain, for the excursions of the Spirits, seem to be too largely open; because the Images hidden or laid up, are raised all at once, out of the utmost, and all the places of the memory, which together with others, suggested from the Phantasie to the common sensory, tumultuously, bring forth such manifold and highly confused notions. There is only wanting to the sensitive soul, for its expansion to be straitned or loosened, within the Head (which certainly the inflammation of the *Meninges* would effect) rather than that it should be dilated above measure, and that all the Pores of the Brain should be unlocked and carried beyond its wonted compass. Perhaps it may happen, from a long continuance of this Disease, that the Blood being greatly heaped up within the Vessels of the *Meninges*, and there stagnating, that it may at length bring forth an Inflammation in them; and then for that reason, we may suspect, (because it often so falls out) that the *Phrensie* doth pass into the *Carus*, or *Lethargy*, of which *phrensical* persons often dye.

The *Phrensie* not from the Inflammation of the *Meninges*.

The *Paraphrenesis* not from the Inflammation of the *Diaphragma*.

No less do we reject the Inflammation of the *Diaphragma*, which cause of the *Paraphrenesis*, Galen in times past, and moved by his authority, most Physicians in every age since, asserted: Anatomical observations plainly prove the contrary. Sometime since, dissecting the dead Carcase of a Maid, dying of a sudden *Leipothymy* or swooning away, we found in the fleshy part of the *Diaphragma* a great Imposthume, with a bag full of filthy matter, and watery little bladders; yet she was not troubled ever with a *Delirium* or *Phrensie*. Some time since also when we had made an Anatomical Inspection of a Gentleman of the University, (of whom we have made mention in a late Tract) who dyed of a long spurious *Pleurisie*, it manifestly appeared, that a great Imposthume being ripened in the *Pleura*, and the intercostal Muscles, and broke inwardly, that a vast plenty of matter had flowed forth into the cavity of the *Thorax*, which gnawing the *Diaphragma* lying under, had made a great hole in it; nor was this man however in all his sickness *Delirious*, or Frantick. Wherefore, I think this Distemper scarce ever to be produced from such a cause: but that opinion seems to arise from hence, because oftentimes in a true *Phrensie*, together with a continual raving, the motion of the *Diaphragma* is wont to be hindred or perverted; as is gathered from the unequal and difficult breathing, to wit, sometimes anhelous or breathing short; and as it were suspended, sometimes short and swiftly repeated, with sometimes a double breathing; which kind of symptoms, and also at the same time the alienation of the mind, are said to proceed from the Midriff being inflamed, and for that reason convulsed; wherefore the Ancients called the *Diaphragma Phrenes*: But there was no need for this, if they had consider'd, that the whole action of the *Diaphragma*, doth depend upon the flowing forth of the Animal Spirits from the *Cerebel*, and therefore there is a necessity, if the *Phrenetick* matter invading the Brain, some part of it should with it rush into the *Cerebel*, that besides the raving, the motion also of the Midriff, though of it self innocent, should be altered; as we have shewed elsewhere more largely.

Wherefore breathing is hurt in this Disease.

The formal Reason of the *Phrensie*.

Therefore the formal reason of the *Phrensie* seems to consist in this, that the Animal Spirits being at first very much irritated in the whole Brain, are driven into inordinate, very confused, and also impetuous motions; so that the acts of every Animal Function are depraved, and variously perverted; and at the same time, very many Ideas of things being raised up out of the memory, the old are confounded with the new, and some evilly joined, or wonderfully divided, are confounded with others, the imagination suggests manifold *Phantasms*, and almost innumerable, and all of them only incongruous; and the common sensory represents the images of sensible things distorted, double, or incoherent; that hence the mind and the will, choose or pick out nothing but ridiculous and impertinent conceptions and passions; and cause the actions of the body to become almost only irregular. Moreover, the spirits being struck as it were with madness, tumultuate not only in the Brain, but also in the *Cerebel*, and every where in the nervous Stock; wherefore, *Frantick* people not only talk idly, but breathe unequally, speak aloud, strike with their fists, sling about their hands and feet, yea and stretch forth all their members with a mighty strength, and a most strong force, that indeed the whole Soul seems to grow hot and furious in the whole body, to be mad, or rather as it were to be inflamed

inflamed with a sudden burning. And truly a *Phrensie* cannot be more aptly defined, than that it is a burning or inflammation of the whole sensitive soul, or animal spirits, as to their whole *Hypostasis* or Constitution. This burning always beginning from the spirits inhabiting the Brain, and wandring from thence into the other parts of the sensitive soul, seems to receive from the Blood, first growing hot and raging with a Feavourish fire, both the first incentive matter, and then the constant food of the burning. For indeed it is probable, that the blood burning Feavourishly, doth pour forth on the Brain sometimes sulphureous Particles; together with the spirituous, which being half inflamed, and after a sort burning forth, penetrate together with the others, and from thence immediately entring into all the marrowy and nervous passages, adhere every where to the spirits, and so render them being inflamed, highly rageing and implacable. Certainly it is more likely, that the *Phrensie* is rather excited after this manner, by an inflammation of the Spirits, than from that of the *Meninges* or of the Brain, which more surely causes an Headach or *Lethargy*, than a Fury, as we have frequently found by *Anatomy*.

This Disease proceeds from the burning of the Animal Spirits. The inflammation of the Meninges stirs up rather the inveterate Headach, or the Lethargy, than the Phrensie. Prosper Martianus also asserts this.

And indeed, that it is so, is not only ours, or any new opinion, but that great follower and best interpreter of *Hippocrates*, *Prosper Martianus*, who hath affirmed the same thing, almost in exprefs words, viz. Comment on his Book *De Morbis* 3. vers. 99. pag. 151. he says, "That *Hippocrates* doth call the *Phrensie* a *Delirium* with a Feavour, which is continual, and depends upon a firm and stable Distemper: to wit, from an inflammation of those parts, which serve to institute Nature, Reason, and the Mind; For so the Animal Spirits, whose viciousness cause the *Delirium*, do not grow hot as it were by a simple quality, but are altered as to their substance. This Man manifestly distinguishes between heat and flame, and affirming that to be in respect of quality, and this an alteration in respect of substance, plainly ascribes the cause of the *Phrensie* to the inflammation of the Spirits. He has in the same place more things apposite to our matter, to wit, that the containing cause of the *Phrensie* was not the inflammation of the *Meninges*, but of the Spirits, whose substance is indeed altered, that is, forasmuch as it is become fiery, such a continual *Delirium* is excited.

I have oftentimes compared the production of the Spirits from the Blood into the Brain, to a Chymical Distillation; of which it is observed, if the spirituous sulphureous liquor be provoked with too strong a fire, that in Distilling it sometimes takes fire, and ascends in the *Alembick* with a very great flame. This is known of Oyl of *Turpentine*, of it self, or with the Flowers of *Sulphur*, to the great loss of some. In like manner we may believe, that the blood growing more strongly hot, doth often communicate also a burning to the Spirits distilled out of it, viz. that some half burnt Particles, do insinuate themselves into the Pores of the Brain, which rushing into all the passages of the Spirits, both there and in its appendix, every where inkindle the Spirits, and compel them into most swift motions, almost like Lightning.

Chymical Spirits in their distilling are sometimes inflamed.

So the Animal Spirits.

But because the *Phrensie* doth not come upon all Feavours, but only on those highly burning, the reason is plain by what follows; to wit, the closure of the Brain ought to be so shut up, that not only any extraneous thing might not be poured into them, but that the more intense flame of the Blood, however burning it be, and though planted round about, might not be able to break thorow; wherefore, some distemper'd with a burning Feavour, although the Blood grows hot thorow the whole, the Bowels burn, the Marrow rages, the Tongue and Jaws rosted like a coal, yet the Brain being still firmly shut up, all the Animal Functions remain whole and sound. But on the contrary, others who have a weak and too loose a Brain, and their Blood more sulphureous than it ought, become *Phrensic* not only from a burning Feavour, but sometimes from a more gentle visit. By reason of what foregoing cause, and for what occasions, or evident causes, this is wont to happen, is the next thing we shall inquire into.

What the disposition of the Brain is to the Phrensy.

Hitherto hath been shown that the immediate subject of the *Phrensie* is the sensitive Soul, or the *Hypostasis* of the Animal Spirits, and that the formal reason of the Disease doth consist in their Inflammation, and that the conjunct cause is the sulphureous particles poured forth from the Blood into the inclosures of the Brain, and there continually inkindling the Spirits; and now it is no difficult matter to assign its *procatartick* or foregoing causes, which we find partly in the Blood, and partly in the Brain and its inhabitants.

The Procatartick causes of the Phrensy,

The previous disposition of the Blood, disposing to the *Phrensie*, is sometimes simple, sometimes twofold; the former is an hot, sharp, or bilous constitution of it, to wit, that contains very many sulphureous Particles in it self, which are apt to inflame the

which arise partly in the Blood, and

the

the Blood in a Feavour more than ought to be, and to insinuate its burning into the Brain. This disposition, when it is very potent and active, often produces this Disease of it self; but for the most part, there is another disposition of the Blood, which helps that former, and renders it more efficacious, to wit, that, besides the sulphureous and inflameable Particles, there are others sharp and penetrative, which enter into the Pores, and open them, so that the former more easily enter in, or are introduced: This the saline little Bodies, conjoined with the sulphureous, do in a manner effect; hence Cholerick and Melancholick persons growing Feavourish, are more prone to become furious; but much more do the *Heterogeneous* Particles, implanted in the Blood, and moved by a Feavour, open the doors of the Brain, and intromit all that are inflameable: wherefore a *Phrensie* frequently comes upon the Small-Pox, and malignant, and Pestilential Feavours.

Partly in the
Brain.

The other provision to a *Phrensie*, which is of the Brain, consists partly in its temper and conformation, and partly in the disposition of the Spirits inhabiting it: As to the former, those indued with an hot and dry Brain, are found to be most prone to a *Phrensie*; not because that constitution is more obnoxious to an inflammation or burning, (for to this it is less apt) but because in such a Brain, otherwise than in an hot and moist, or cold and dry, the Pores and passages are more open, and too much gaping, and so give an entrance to the incentive matter, suggested from the Feavour; which besides, they much more easily admit, if the Spirits being very fugacious or apt to flight, or *pathetick*, or passionate, are upon every light occasion ready to fall into passions of sadness, fear, anger, or hatred; so that they resist not the incursions of the extraneous matter, and more readily conceive a burning themselves.

The evident
causes of the
Phrensie.

The evident causes of the *Phrensie* are either more remote, viz. whatever things are wont to excite a Feavourish intemperance; as Surfeits. Drunkenness, a very vehement disturbance of either body or mind, usual evacuations being suppressed, with many others; or more near, as a Feavour, and its dependences and adjuncts; to wit, if it be pestilential, malignant, or after an evil manner; if it arises by reason of a Surfeit taken from very incongruous Meats or Drink, or if it succeeds violent passions, as of Love, hatred, envie, indignation, or sadness; or immoderate studies: for these kind of occasions render the Blood and Animal Spirits, growing Feavourishly hot, very propense to the frantick Distemper.

The differences
of it.

Since that this Disease depends rather and more immediately upon the Soul than upon the Humors or solid parts being distemper'd, its kinds and differences are neither various nor manifold: In respect of magnitude, the *Phrensie* is either great or moderate, also continual or intermitting; to wit, according as the Animal Spirits are more or less inflamed, and as they receive the food of their burning continually from the Blood, or by turns. Secondly, As the burning begins only in the Brain, or together with it in the Cerebel, it is commonly distinguished into the *Phrensie*, or the *Paraphrenesis*; which is as much as to say, that either the spontaneous Animal Functions are only or chiefly hurt, or else together with them the vital also. But this Disease as to the Feavour, on which it depends, hath its nature and manner malignant, or free from malignity; also according to the temper of the sick, the *Phrensie* is distinguished into Sanguineous, Cholerick, Phlegmatick, or Melancholick; and this not improperly, for the Animal Spirits are wont to grow hot and burning, after a diverse manner, in this Disease, according to their various dispositions.

The Prognostick.

The *Prognostick*, in this Disease is always doubtful, and the event is to be instituted with an evil suspicion: For the *Phrensie* of it self (as *Trallianus* says) is a most acute and most dangerous Disease; then, if it comes upon a Pestilential, or malignant Feavour, or of some other evil kind, we cannot but expect the end of it to be mortal.

If a *Phrensie* happens in a sound body, well habited, of a Sanguine temperament, and young, there is greater hopes of health, than if it were sickly, aged, lean, or Cholerick, and obnoxious to violent Passions.

If the *Phrensie* remitting by frequent turns, have lucid intervals, it is better than if the fury should be undiscontinued: But if the sick sometimes seem to be better, yet after moderate sleep to awake always furious, it is a sign that the Disease is pertinacious, and for that reason dangerous; for that a new stock of incentive matter is from thence carried to the Brain; which indeed we have elsewhere shewn to be made far more plentifully in sleep than waking.

A *Phrensie* is in a short time terminated with the Feavour, either in health or death; or else it is protracted, and remains after the Feavour; or at length it is healed, or passes into other Diseases, to wit, the *Lethargy*, or *Madness*, or *Melancholy*.

If the Feavour having a laudable Crisis, either by Sweat or great quantity of Urine,

is

is fully cured, for the most part the *Phrensie* also ceases: but if the Feavour be not cured and carries still the Morbific matter to the Head, so that besides the Animal Functions being depraved; the vital begin to fail (which appears by the Pulse and breathing being altered for the worse) if the Urine be pale, if that frequent bleeding at the Nose, if Vomiting, and Convulsion happen, the *Physician* concludes death to be at hand.

Sometimes a Feavour, though it be not at once or fully Cured, yet passing away afterwards slowly and by degrees, leaves a *Phrensie*, or a talking idly behind it; which, if it doth not by its stay obliterate the former tracts of the Spirits in the Brain, either will end by little and little of its own accord, or is to be healed by the help of Remedies.

If that by reason of the *Phrensie* being long protracted, the *Meninges*, or the *Cortex* of the Brain, be possessed from the Blood, or *Serum*, there heaped up, and stagnating; with an inflamed tumor, or a serous deluge, the *Debargy*, or sleepy Diseases follow; the Cure of which is often very difficult, or not at all. But if from a long *Phrensie*, either the Animal Spirits (though their burning should cease) contract a vicious nature, or that the passages and Pores of the Brain are perverted, a perpetual raving oftentimes succeeds, the former Disease passing into Madness, or Melancholy, or foolishness or stupidity. Wherefore it is vulgarly said of those that are *Franick*, and not soon Cured, that their Brains are crack'd or broken, so that after that, they are always Mad or raving.

In the Cure of the *Phrensie*, we ought to respect at once the Feavour and the Eury. The Feavourish burning of the Blood, or its immoderate growing hot (which for the most part is the antecedent cause of the other effect) ought in the first place to be appeased and allayed, and the Animal Spirits to be cherished, and freed from any great burning. If the *Phrensie* happens about the beginning of the Feavour, or the middle of it, the same Remedies in a manner, and the same method of curing conduce to either end: But if this Distemper comes upon this, whilst it is at a stand, or at its height, the means of Curing are oftentimes repugnant to either, and there is need of great caution, lest whilst we endeavour to help one Disease, we do not increase the other; in this case, the vital indication concerning the preserving of strength, obtains the first place; and the taking away of blood, or purging, is not to be rashly and copiously celebrated.

In the former case, when the Feavour and the *Phrensie* are almost both of an age, *Phlebotomy* rarely or never is to be omitted, but is presently to be performed, and if strength will bear it, let it be afterwards repeated. For nothing depresses and diminishes the immoderate flame of the blood, like to this Remedy, and nothing more averts or recalls its burning from the Animal regiment: Wherefore, if the matter requires it, let a vein be opened, sometimes in the Arm or Hand, sometimes in the Leg or Foot, and sometimes in the Neck or forehead: perhaps sometimes it may be expedient to open the temporal Artery: yea also to take away blood in other places by Leeches, and sometimes by Cupping-Glasses. For this gives the chiefest help, and according to *Galen*, is the most powerful and principal Remedy, and is wont to fulfil very many indications in a *Phrensie*.

But for the prevention of the Feavourish matter being carried from the Bowels into the Head, Clysters are of chief use; with which, if need be, let the Belly be continually kept slippery. Vomiting Medicines, and Purging, unless very gentle, have very rarely any place here. Cataplasms of Rue, Chamomel, Vervine, Bryony Roots, red Poppies, with Sope, may be laid all over the Feet; or instead of them, may be applied Pigeons or Chickens, cut up and laid warm: In the mean time, as you see occasion, there ought to be prescribed Juleps, Apozems, Powders, and Confections, by which the rage of the Blood, and the burning of the Animal Spirits may be allayed.

Take of Pipin Water, Black Cherry Water, and Cowslip Water, each four ounces; Water of the whole Citrons two ounces, of Pearl powder'd one dram, of Syrup of the juice of Citron one ounce; mingle them and make a Julep: let three ounces be taken three or four times in a day. *A Julep.*

Take of Grass Roots, of the Leaves of Wood-Sorrel, and Pimpernel, each one handful; of Barly half an ounce, of Apples cut, of Currans, or Strawberries, or Raspberries, one handful; let them be boiled in four pints of Spring-water, till a third part be consumed; clarify it, and strain it; then add to it of the Syrup of Violets one ounce, and of Sal Prunella a dram and a half. *An Apozem.*

A Drink.

Take of the Leaves of Borage fresh gathered and young, four handfuls, of Wood-Sorrel two handfuls, two Apples sliced, of Sal Prunella two drams, the pulp of one Orange, of white Sugar one ounce; let them be bruised together, and pour to them of spring-water two or three pints; let them be strongly squeezed forth, and kept in a Glass, and cleared from its setting; let six or seven ounces be taken of this often in a day, when they will. For the quenching of thirst, let the excellent drink of Palmetus, viz. Spring-water with Sugar, and the juice of Lemons, or Water, or Posset-drink with Elm leaves, or Pimpernel infused or boiled in it, be drunk: Emulsions of the Decoction of the roots and flowers of Water-Lilies, with Melon-seeds; or else Spring-water distilled with the pulp of boiled Apples dissolved in it.

Hypnoticks.

Hypnoticks or Medicines causing rest, are often very necessary in this Disease; but yet the stronger are not convenient in the beginning, nor let them be frequently used; because sleep caused by Opiates, carries more morbid matter to the Brain, and fixes it more deeply there.

Take of the Water of Cowslip flowers four ounces, of the Syrup of Poppies half an ounce, of Pearl one scruple; make a drink to be taken at night late.

Take of the Seeds of white Poppy two drams, of Sugar-Candy a dram and a half; bruise them together, and pour to them of white Poppy Water six ounces; make an expression, to be taken after the same manner.

Narcoticks or Stupefying Medicines, which are made of things meerly cold, are cautiously to be exhibited; because they agree not with some, who have the Fibres of their Stomach very tender and sensible. I have often observed these kind of *Hypnoticks*, to have stirred up a great oppression in the Ventricle, and then presently an Inflation or blowing of it up; and a little after distractions and inordinations of Spirits use to follow in the Brain, yea in the whole Body; so that there was not only a frustration of sleep, but great disquietness was stirred up.

Take of liquid Laudanum, prepared with the Salt of Tartar, or the juice of Quinces, Let a Dose of it be taken in a convenient liquor.

External Medicines causing Sleep.

Things inviting Sleep, as *Epithems* or moist Medicines applied to the Temples and Forehead, are often used with success; of which sort are Rose-cakes dipt in Vinegar, Rose-water, and grated Nutmeg, an Embrocation or washing with Water or Milk, Oyntments of Oyl of Nutmeg by expression; Oyntment of Poplar, to which sometimes may be added of Opium five or six grains; or a Cake of Poppy flowers, with Vinegar and Nutmeg, &c. Further, for this end, rather than for the taking away the inflammation of the *Meninges*, the hot Lungs of a Lamb or Weather, as also Pigeons or Chickens slit in two, do often give notable help. Also for this use Housteek braised, and mixt with a Womans Milk, and applied to the hinder part of the Head being shaved, is wonderfully praised; Also the Epithem of Penotus, of twelve grains of Nutmeg, of Camphir half a scruple, and the Tincture of Rose-water impregnated with red Sanders twenty ounces, is commended by some.

Epithems.

Further, they are wont to apply *Epithems* not only to the Head, but also to the Heart, Liver, and other parts: A little bag of silk may be applied to the *Præcordia*, with Cardiac Species being sewed or quilted in it, with silk, and sprinkled with Rose-water, or Vinegar of Roses; also rags wet in Rose Vinegar, may be laid to the Testicles: The Feet may be bathed with a Decoction of Willow leaves, Lettice, or the brads of white Poppy. But these kind of cooling Topicks only, and cherishers are to be used in the beginning of the Disease; but in its height, resolvers and softners, are to be added, as the Flowers of Chamomel, Melilot, Elder, &c. also the leaves of Mallova, Orage, Marjoram, Hyssop, and such like: In the declining of the Disease, resolvers only, and those sparingly are to be administered.

The means for the preserving of strength.

In the mean time, there ought to be great means used, for keeping up of strength, for that too much failing, all hopes of Cure is lost: For strength is quickly worn out, by reason of great watchings, the perpetual agitations both of the body and mind, a thin Dyet, and Phlebotomy sometimes often requisite. Wherefore, great care must be had, lest whilst we endeavour to root out the Disease, by Purging or frequent letting of Blood, we should suddenly debilitate the Vital Function: If this begins to fail, the *Phrensie* being let alone, a better dyet may be granted, and especially Cordials are to be used.

Take

Take of the Tincture of Coral half an ounce, take of it twenty drops, twice or thrice in Cordials. a day, with a Dose of a Cephalick or a Cordial Julep; or let it be given with Coral dissolved in Milk, made with the juice of Oranges, one Spoonful often in a day.

Take of the Rob or Conserves of Rasberries, and Barberies one ounce, of prepared Pearl, of Magistery of Coral, each one dram; of Confection of Hyacintha two drams, Syrup of the juice of Alchermes, what will suffice; make a Confection, and let the quantity of a Nutmeg be taken three or four times a day, drinking after it of the following Julep three ounces.

Take of the Water of the Flowers of Water-Lilies, red Roses, and of Elm leaves, each three ounces; of the Syrup of Coral two ounces, of the Cordial Water of Saxony one dram; mingle them.

Take of the Conserves of the Flowers of Water-Lilies, and of Violets, each one ounce; the Stalks of Lettice candied or preserved half an ounce, of the Powder of red Coral, bruised in a mortar with the juice of Orange and dried, two drams; of the Species of Diamarg. frigid. one dram, of white Poppy seeds one dram and a half, with what will suffice of the Syrup of the juice of Wood-Sorrel; make an Electuary; let the quantity of a Nutmeg be taken often in a day.

In the Phrensie, not only the Belly, but also the Bladder, and their offices, ought to be thought on, and often solicited or provoked.

Wherefore, the sick are to be warmed, and the Urinal given them, and asked to make water; but if they will not, or cannot, let the region of the yard below the belly be bathed with a Decoction of Pellitory of the wall, Elder Flowers, and of the Seeds of Parsley, and wild Carrot Seeds, or daucus; with a Sponge; and, after the Fomentation, anoint it with Oyl of Scorpions, and Oynment of Dialthea: In a long suppression of Urine, you may put up to the bladder a piece of Wax Candle.

The Histories and cases of Frantick people are so many, and so diversly described, and so accurately by Hippocrates in his Books *De Epidem.* that there seems little need here to add others; especially, because it would be an immense work and tedious, to relate the various manner and cases of Mad-men: In the mean time, as to the event of the Disease, there is great diversity; for that for the most part the Feavour being cured, the Phrensie ceases by little and little; or else, that having no, or an evil, Crisis; either death, or a long raving follows. But that our Hypothesis, of the Inflammation of the Spirits, may be illustrated, I shall propose here one more rare instance.

The Histories of sick persons in Hippocrates Lib. Epidem.

I was one time sent for to Cure a Maid, that was strong, and having a Feavour, was highly raging, being continually bound in her Bed. I took from her a great quantity of Blood, and caused it to be again iterated; I often took down her Belly with Clysters; yea I ordered all the other administrations in order, usual in this case; in the mean time she took Juleps, Emulsions and Hypnoticks: But these little or nothing availing, she continued still for seven or eight days without sleep, and furious, perpetually calling and bawling for cold drink; wherefore an *Hydropick* being granted her at her pleasure, yea to satiety; she was nevertheless not any thing less quiet, or thirsty: I therefore bid them (for that it was Summer time) that in the middle of the Night she should be carried by Women forth of doors, and put into a Boat, and her Cloths being pull'd off, and she tyed fast with a Cord, should be drenched into the depth of a River, the Rope being tyed only about her middle, that she might not be stifled in the Water; but there was no need of that, for the Maid of her own accord, fell to swimming, that scarce any Man could do it better, who had learned the art: After about a quarter of an hour, she came forth of the Water sound, and sober, and then being had to Bed, she slept, and sweat very much, and afterwards, without any other Remedy she grew well. This Cure succeeded so happily and so suddenly, forasmuch as the excess both of the Vital and the Animal flame, being together immensely increased, was taken away by a proper Remedy for the more intense Fire; to wit, by the moistning, and cooling of the Water.

A notable History.

C H A P. XI.

Of Melancholy.

The Distemper of the Animal Spirits, being after a diverse manner, as it is the cause of the Phrensie, so it is of Melancholy, Madnes, and Stupidity. The definition of Melancholy. That it is a Distemper of the Brain and Heart.

Its Examples or Types various, and almost infinite.

Melancholy is either, 1. Universal, or

2. Particular.

The primary Phenomena of a Melancholick Delirium.

From what disposition of the Spirits they proceed.

AS the Phrensie arises from the burning of the Animal Spirits, (as we have elsewhere shewn) or as *Prosper Mart.* seems to affirm, from their substance being inflamed; so indeed other Distempers of raving arise from their substance being altered by other ways, and from their genuine nature being changed, from a *spirituous-saline*, into an acetous or sharp disposition, like to *Stygian Water*, or else into a liveless; which therefore are either *Melancholy*, or *Madnes*, or *Foolishness* or *Stupidity*: of which we shall now speak in order, and first of all of *Melancholy*.

Melancholy is commonly defined to be, a raving without a Feavour or fury, joined with fear and sadness. From whence follows, that it is a complicated Distemper of the Brain and Heart: For as *Melancholick* people talk idly, it proceeds from the vice or fault of the Brain, and the inordination of the Animal Spirits dwelling in it; but as they become very sad and fearful, this is deservedly attributed to the Passion of the Heart.

It would be a prodigious work, and almost an endless task to rehearse the diverse manner of ravings of *Melancholy* persons; and there are great Volumes already of Histories and examples of this sort; and more new and admirable observations and examples daily happen. Fabulous antiquity scarce ever thought of so many *metamorphoses* of men, which some have not believed really of themselves; whilst some have believed themselves to be Dogs or Wolves, and have imitated their ways and kind by barking or howling; others have thought themselves dead, desiring presently to be buried; others imagining that their bodies were made of glass, were afraid to be touched lest they should be broke to pieces. There are extant manifold and various kinds of the Imagination so depraved, concerning which may be commonly observed; That the distemper'd are *Delirious* as to all things, or at least as to most; so that they judge truly almost of no subject; or else they imagine amiss in one or two particular cases, but for the most part in other things, they have their notions not very incongruous. We shall first inquire into this more universal Distemper, for that the Imagination is prevaricated concerning very many things; to wit, by what causes, and with what difference of Symptoms, this is wont to come to pass; afterwards we shall speak of the special raving or idle talking.

Although the universal Distemper of *Melancholy* contains manifold *Delirious Symptoms*, yet they chiefly consist in these three; 1. That the distemper'd are almost continually busied in thinking, that their *Phantasie* is scarce ever idle or at quiet. 2. In their thinking they comprehend in their mind fewer things than before they were wont, that oftentimes they roll about in their mind day and night the same thing, never thinking of other things that are sometimes of far greater moment. 3. The *Ideas* of objects or conceptions appear often deformed, and like hobgoblins, but are still represented in a larger kind or form; so that all small things seem to them great and difficult.

After this manner the *Phantasms* in the Brain evilly affected, are objected to the Intellect, almost after the same manner as the visible images are shewed to the Eye, by the interposition of some Optick Glass; to wit, where every object appears an horrid and huge monster, and for that reason a small portion only of the visible matter or thing, being increased to that immensity, is received by the aspect; then by reason of its horrid and unusual appearance, the image being once conceived, is not easily or suddenly let go: we will now consider by what affection of the Brain and Spirits, these appearances happen.

Here we shall first of all inquire into the disposition or preternatural Constitution of the Animal Spirits: For inasmuch as they are after an irregular manner, they always or for a long time continue in their irregularities; and when the *Palsie*, *Apoplexy*, *Vertigo*, or *Convulsion*, are not joined to this Distemper of theirs, which argue obstructions of the Brain, it may be inferred, that the Animal Spirits, not fetching their force elsewhere, are driven into such inordinations; nor do chiefly conceive their disorders, by reason of the Pores and passages of the Brain being obstructed; but rather, in this case, they cause these aforesaid *Symptoms* in the sick from the default of their own Nature.

Such

Such an indisposition of the Animal Spirits is wont to be described after this manner; to wit, that they, when as they ought to be transparent, subtle, and lucid, become in *Melancholy* obscure, thick, and dark, so that they represent the Images of things, as it were in a shadow, or covered with darkness: The explication of which does not seem incongruous; forasmuch as we have already shewed, that the Animal Spirits flowing forth from the inkindled Blood, go forth after a manner, as the rays of light from a flame. And it sufficiently appears, that the light shews and illustrates it self diversly, according as it proceeds from the burning of bodies, flaming forth after a various manner; as of Spirits of Wine, Oyl, Fat, Mineral Sulphur, Nitre, and others: in like manner the Animal Spirits, forasmuch as stilled forth from the Blood, having got this or that, or some other disposition, they are either subtil, clear, or dull, thick, and as it were sooty, they variously pass thorow and irradiate the organs of the Animal Functions, and so for that reason, diversly pervert their actions.

As they are compared to Light, they are called opacous, or full of darkness.

But further, when as the Animal Spirits are not wholly loose and free as the little bodies of light, but mutually cohere or stick together, and lest the continuity of the soul should be broken off, they ought to be contained in a certain *Latex*; therefore these, with the Vehicle to which they cleave, may be very aptly compared to some *Chymical Liquors*, drawn forth by distillation from natural mixtures. Which *Analogy* indeed seems fittest for the unfolding the mad distempers.

These kind of Spirits in Melancholy compared to those in Chymical Liquors.

1. Liquors *Chymically* Distilled, are, according to the active Elements after a various manner combined in them, of a diverse kind: the chiefest of these, by the consent of all, are said to be such, as in which the Spirit being united with the Salt, doth volatilise it, and on the other side is sharpened by it, and after a fort fixed or kept. Of this sort they conceive the great *Elixir* and the Liquor *Alcahest* to be; and indeed in a manner are the Spirits of Blood, of Harts-horn, of Soot, and such like, very subtil, volatil, and penetrating, yet not apt to be inflamed, or suddenly to be dissipated. And indeed, the Animal Spirits seem to be after a manner, having obtained a sound and legitimate disposition, like a spirituous liquor stuffed with a volatile Salt, which is distilled from Blood; besides, to this there is given from the fire an high Acrimony and *Empyrenma*, or smatch of burning, which are wholly absent from the liquor watering the Brain and Nerves.

1. They are not like the Spirit of Blood, as they should be.

2. Other *Chymical Liquors* are sulphureous and burning, as the Spirits of Wine and Turpentine, which consisting of Spirit and Sulphur combined together, are easily inflamed, and depart one from another of their own accord, and fly hither and thither what way they can find; the Animal Spirits of this nature, as we shewed in the former Chapter, seem to be in the *Phrensie*.

2. Nor like the Spirit of Wine: Such rather in the Phrensie.

3. Some Liquors or Spirits are produced by *Chymical* operation, in which the fixed Salt being carried forth to a Flux, hath obtained the dominion; of which sort are such as are distilled from Vinegar, ponderous Woods, and some Minerals, with a gentle fire; whose particles are very moveable, and unquiet, but of a short activity, so that Effluvia's do not long flow from them, that if they should be distilled in *Balnea*, nothing but an insipid Phlegm would be carried into the *Alembick*. And indeed, the Animal Spirits in *Melancholick* Distempers, are to be suspected to be of this kind of acetous nature, with the dominion of a fluid salt, as shall hereafter be more largely shewed.

3. But these are like acid Spirits, distilled out of Salt, Vinegar, Box, and such like.

4. Some *Stagmas* drawn forth by *Spagyrick* art, are sometimes most sharp, to wit, in which the untamed Particles of a fluid Salt, and also Sulphureous, and *Arsenical*, being combined together, are exalted; as are the *Strygian Waters* distilled out of Nitre, Vitriol, Antimony, Arsnick, Verdigrisee, and the like, all which are of a fierce nature, very penetrating and not to be broken, so that their Effluvia's are agitated with a perpetual motion, penetrate every thing, and are also diffused far and wide. And these kind of Liquors, may be aptly likened to the disposition of the Animal Spirits, acquired in *Madness*, as shall be anon declared.

4. Stygian Waters are like the Nature of the Animal Spirits in Madness.

But for the present, that we may deliver the formal reason and causes of *Melancholy*, let us suppose, that the liquor instilled into the Brain from the Blood (which filling all the Pores and passages of the Head, and its nervous *Appendix*, and watering them, is the Vehicle and bond of the Animal Spirits) hath degenerated from its mild, benign, and subtil nature, into an Acetous, and Corrosive, like to those liquors drawn out of Vinegar, Box, and *Vinical*; and that the Animal Spirits, which from the middle part of the Brain, irradiating both its globous substance, as also the nervous *System*, and do produce all the Functions of the Senses and Motions, both interior and exterior, have such like Effluvia's, as fall away from those Acetous *Chymical Liquors*. Concerning which there may be observed these three things, 1. Their

The formal Reason of Melancholy aptly represented by acetous Chymical Liquors.

being

There are three chief affections of these, which agree with the Animal Spirits in Melancholy.

1. Effluvia falling away from these Liquors are perpetually in motion.

In like manner also the Spirits in the Phantasia of a Melancholick person.

2. Effluvia from acetous Chymical Liquors do not proceed far.

In like manner the imagination of a Melancholick Person, though always employ'd, comprehends only a few things.

And therefore every thing is conceived with a greater image than it should be.

3. Effluvia from acetous Liquors do not evaporate so much from open Pores, as they make new.

being in perpetual motion: 2. Not long able to flow forth: 3. not only to be carried in open ways, but to cut new Porosities in the neighbouring bodies, and to insinuate themselves into them. From the *Analogy* of these conditions, concerning the Animal Spirits, it comes to pass, that *Melancholick* persons are ever thoughtful, that they only comprehend a few things, and that they falsely raise, or institute their notions of them. We shall consider of each of these a little more largely.

1. Therefore we shall take notice, that the Effluvia's falling away from these distilled Acetous Liquors, are perpetually in motion: for the Spirits of Vitriol, or of Vinegar, or Sea Salt continually evaporate: the reason of which is, because those Particles of the fluid Salt do scarcely agree with any others, but where ever they are stopped, being apt immediately to leave their subjects, seem to endeavour to get new comforts. And hence some have thought nothing more like to perpetual motion, than the Acid Spirits of Minerals, shut up and *Hermetically* seal'd in a Phial; for so the Vapours or Effluvia's will creep about the sides of the Glass, with a continual Circulation. In like manner we may suppose, That the nervous Acetous Liquor is instilled from the Blood, sometimes stuffed with a fixed Salt, or with Vitriolick Particles, or other heterogeneous, into the Brain, for the matter and Vehicle of the Animal Spirits; and so these being admitted within the middle part of the Brain, for the acts of the Animal Functions, do not quickly pass thorow and irradiate all the Pores and Passages, but like little-acid Atoms, creep about here and there, slowly, but incessantly, and as it were with a certain unquiet motion of tingling or creeping, diffuse themselves by little and little thorow the whole neighbourhood: Hence a storm of thoughts is perpetually stirred up, by which the Brain is wont to be busied without intermission; so that *Melancholick* persons have continually, day and night, disturbed Phantasies; for that their Animal Spirits consist of a continually moveable matter; Hence also they look with eyes turned inwards, or fixed, or obliquely, and fullen or dogged, and exercise the other faculties both sensitive and loco-motive inadvertently; because the Spirits being worn out and distracted by continual motion, do not well actuate or beam into the nervous System.

2. Though the Effluvia's continually fall away from an Acetous Spirit, prepared by Chymical Art, yet they do not go far, but gather together on an heap thickly, near the superficies of the liquor, and penetrate only the neighbouring bodies, not touching those that are at a distance: Hence the Spirits of Vitriol, Salt, or Vinegar, will not ascend out of the *Cucurbit* into the *Alembick* unless urged with a very strong heat; but being included in a low Phial, they shall corrode and pierce thorow the stopple.

It is after the same manner, concerning the Phantasia of Melancholick persons; for inasmuch as the Animal Spirits being degenerate into an acid nature, do not irradiate or quickly pass thorow the whole compass of the Brain, as before, but flowing in the middle part, are carried with its force only into the nearest Pores and Passages; therefore cogitations raised up from thence, though they be continual, yet they comprehend but a few things: and so, as when many bands of Spirits are thrust together in strait bounds, every small object, and of very little moment, seems to them very great and of notable weight; certainly after the same manner, and for the same reason, as when the visible images passing thorow a Microscopick Glass are carried to the Eye; for, because many beams of the same thing are concenter'd, its magnitude seems to be increased into an immense greatness; so when as every intentional Species or Image, by the conflux of very many spirits together, is formed in the Brain, it appears to the soul greater and of more weight than usual. Every one may experiment this truth in himself: For when as we become thoughtful, from eating gross or melancholick meats, or by reason of the passion of sorrow (the reason of which affection is, because the Animal Spirits are unfit for a more free expansion) then we are very solicitous and fearful, concerning every little thing, as if then our health or fortune were for ever in danger. Hence also, because the Animal Spirits, though almost ever in motion, are notwithstanding still limited within the same short bounds, Melancholick persons persist a long while in thinking and revolving in their mind often the same thing.

3. But there yet remains another similitude of the Animal Spirits, with those distilled from Vitriol, and other saline bodies, to wit; that as the Effluvia's sent away from these kind of Acetous Spirits, do not evaporate so much from open spaces and tracts, before made, as they cut out Pores and Passages that are new, for themselves, in an objected body; so that they easily pass thorow, and render friable or crumbling, the Cork or stopple to the Vessel where they are; which happens not from the Spirit of Wine, to any thing that stops up the Phial; so indeed in Melancholick persons, it is usually wont to be. For because the Animal Spirits, being as it were pointed with saline

saline Particles, whilst they flow from the middle of the Brain, they observe not their former tracts and ways of their expansion, but they thickly make for themselves new and unwonted little spaces, within the globous substance of the Brain: Hence cogitations are brought before the Soul, not such as they were wont to be, but new and incongruous, and for the most part absurd. But indeed, because the *Phantasie* is prevaricated, about the Conceptions of things, and by reason that the acts of judgment and reason are falsely framed, the only cause is, for that the Animal Spirits leaving their former walks, and going backward and forward in their ways in the Brain, being carried hither and thither obliquely and transverse, affect altogether unaccustomed and bye-ways, which indeed is proper for them to do, out of the Acetous disposition, with which they labour; to wit, forasmuch as the Effluvia of those kind of Liquors expand themselves not in a direct or free emanation, as the rays of light; but by a bending motion, and as it were creeping, they crawl on every side into the neighbouring part.

And in like manner, the Animal Spirits, whilst they form in the Brain new Tracts, produce unwonted and incongruous Notions.

Thus much for the primary *Melancholick* Distemper, to wit, a *Delirium* or Raving, being excited by reason of the vices of the Spirits inhabiting the Brain: The beginnings of which, although they proceed chiefly, and oftentimes, almost only from the Acetous disposition of the Spirits; yet afterwards, the conformation of the Brain itself is often brought to be a part of the cause; to wit, forasmuch as the Recrements of the *Melancholick* Blood, being perpetually poured forth, renders its substance more thick and dark, and the primary tracts or paths of the Animal Function being near blotted out, new, oblique, and by-paths are made; insomuch, that the Spirits, though better should be begotten, could not easily irradiate the Brain, or presently recover their former passages.

In Melancholy, after the Animal Spirits being for some time vitiated, the Conformation of the Brain is also hurt.

Melancholy is not only a Distemper of the Brain and Spirits dwelling in it, but also of the *Præcordia*, and of the Blood therein inkindled, from thence sent into the whole Body: and as it produces there a *Delirium* or idle talking, so here fear and sadness; but by what means we shall now see.

The Affection of the *Præcordia* in this Disease, as to fear and sadness, is delivered.

First, in Sadness, the flamy or vital part of the Soul is straitened, as to its compass; and driven into a more narrow compass; then consequently, the animal or lucid part contracts its sphere, and is less vigorous; but in Fear both are suddenly repressed and compelled as it were to shake, and contain themselves within a very small space; in either passion, the Blood is not circulated, and burns not forth lively, and with a full burning, but being apt to be heaped up and to stagnate about the *Præcordia*, stirs up there a weight or a fainting; and in the mean time, the Head and Members being destitute of its more plentiful flux, languishes. The formal reasons of these Distempers, and their causes, we have before exposed.

After what manner the Corporeal Soul is affected in these two passions.

But because these are habitual in *Melancholick* persons, the cause is partly in the Blood, and partly in the Animal Action of the heart. For the Blood, because of the saline particles being exalted, becomes less inflammable; from whence it is neither sufficiently inkindled in the Lungs, or doth it burn with a plentiful and enough clear flame within the passages of the Heart and its vessels; but is apt to be repressed, and almost blown out with every blast of wind: Hence, when that the vital flame is so small and languishing, that it shakes and trembles at every motion, it is no wonder if that the *Melancholick* person is as it were with a sinking and half overthrown mind always sad and fearful. By reason of this kind of saltish *Dyscrasie* of the Blood, *Melancholicks* rarely have a Feavour; yet being taken with it, by reason of the irregular burning of the Blood, they are more in danger.

The cause of either depends partly on the blood;

No less doth it come to pass, by the fault of the Heart, that *Melancholick* persons become sad and fearful, by reason of the course of the Blood being retarded, and called back from thence: for, because that Muscle is actuated but with an insowing of weak and enormous Spirits, it cannot perform its contractions strongly enough, and constantly, whereby the Blood may be driven forward into the whole body, without stop or leaping back: So the Blood and the Animal Spirits affect one another mutually, with a reciprocal evil, and bring hurt one to the other. That is, the *Melancholick* Blood consisting of Saline Particles, carried forth together with Sulphureous, begets Animal Spirits, indued with an Acetous nature, as hath been shown; and these Spirits wrongly performing the offices of the Vital Function, cause such an evil disposition of the Blood to be increased.

and partly on the Animal Action of the Heart.

Thus much of *Melancholy* in general, viz. of its Essence, Conjoint Causes, and chief Symptoms, together with the reasons of them. Before we proceed to the kinds and differences of this Disease, we ought to explain, from what kind of causes, both *Procatartick* and Evident, it is wont to arise, and to be cherished; and first, from whence either part of the Soul, viz. both Animal and Vital, doth acquire their morbid dispositions.

The procatartick Causes of Melancholy are,

First

Partly the ac-
tious Nature of
the Spirits,
and partly the
Melancholy Dys-
crasie of the
Blood: The Dis-
temper begins
sometimes from
this, sometimes
from that.
How it begins
from the Spirits
and the Animal
Government.

First we say, the former of these to be Acetous, like to the Spirit of *Vitriol* or *Vinegar*, and this to be *Salino-sulphureous*, or *Atrabiliary* or *Melancholick*; further, as the one doth cherish the other, so they at first beget one another. For sometimes *Melancholy* beginning, and for a long time persisting, from the Animal Spirits being disturbed, and driven into a certain confusion, causes the *Melancholick* disposition of the Blood; and sometimes also the Blood, at first contracting this evil disposition, perverts the nature of the Spirits.

That *Melancholy* doth very often arise from the Animal Government, every common body doth sufficiently note; to wit, soasmuch as the Animal Spirits conceive inordinations from violent passions of the mind, in which, when they remain long, they bend the whole Soul, yea and the Body, from their due temper and constitution: So especially destroying Love, vehement sadness, panick fears, envy, shame, care, and immoderate study, are wont oftentimes to excite this Distemper. For by reason of these kinds of occasions, the Animal Spirits being thrust down, beyond their wonted paths of expansion, and remaining in their error, by reason of the assiduity of Passion, at last they go into these deviating tracts, which afterwards observing, they are hardly reduced into their former due ways: Then, soasmuch as for that reason, the motion and vigoration of the Heart (as hath been shewed) is lessened; therefore the Blood is defective in its due temper, and sanguification, and is from thence made more fixed and *Salino-sulphureous*, and the Animal Spirits coming from it, are but degenerate into a sourness; and so the Blood being depraved by the latter, encreases to the *Melancholick* disposition, begun from the Spirits.

By what means
this Disease arises
from the
Blood.

No less often doth it come to pass, that the seeds of *Melancholy*, being at first laid in the Blood, do at length impart their evil to the Spirits: For this reason, some are made obnoxious to this Disease from their Parents. But an inordinate living, long intermission of wonted exercise, usual evacuations, as of the Menstrual Blood, or the Piles, or bleeding at the *Hæmorrhoidal* Veins, also the Seed, or the Serous Matter; being suddenly suppressed, and many other occasions, easily infect, and foul the Blood, and render it *Melancholick*; whose depraved disposition is of necessity communicated to the Spirits.

Melancholy doth
not arise from
an atrabiliary
humour heaped
up in some place
or mine.

But we cannot here yield to what some *Physicians* affirm, that *Melancholy* doth arise from a *Melancholick* humor, somewhere primarily and of it self begotten, and they assign for its birth, several places, to wit, the Brain, Spleen, Womb, and the whole habit of the Body; for besides, for that no such mines of such an humor appear, unless perhaps some be planted in the Spleen; moreover the Blood it self is it, which conceives at first the *Melancholick* intemperance, or any other by it self, and then depotes the Recrements of the same nature, in proper emunctories or receptacles. For neither is the yellow Bile or *Choler* laid up in the Gall-Bladder, or the black Bile so called, or *Melancholick* humor in the Spleen, unless the bloody Mass begets those humors before hand: If at any time these, or other Recrements, being any where laid up, are received of the Blood, they produce its effervescency or growing hot, but not presently or easily its intemperature.

By what means
according to
the Antients, it
is said to arise
from the Head.

Therefore, because sometimes the original of *Melancholy* is ascribed to the Head, and the intemperature of the Brain from these, to wit, too hot, and accused to be from those, too cold, I rather think it ought to be affirmed, that this Distemper doth sometimes at first begin from the Brain, and the Soul dwelling in it: because *Hippocrates* also plainly asserts it, 6 *Epidem. Sect. 8. T. 58*. For distinguishing *Epileptical* and *Melancholick* persons, being made so together, or else successively, as to the formal reasons of the Diseases, he saith, *The defluxion which floweth from the Brain, from the ill affection, state, or temperament thereof, if it flows into the Body causeth the Falling-sickness; if into the cogitation or the mind, Melancholy*. So in *Melancholy* he grants, the Soul distinctly, and as it were apart from the Body, or Brain, to be affected.

How from the
Womb.

Secondly, Because sometimes the original of this Disease is deduced from the Womb, it is not to be thought, that the *Melancholick* humor is there at first generated, but the occasion of *Melancholy* doth proceed from thence; either because the whole Blood being infected, and made degenerate by reason of a stoppage of the *Menstrua*, strives to go into a *Melancholy Dyscrasie* or intemperature; or because, by reason of the provocations of *Venus* or Lust, being restrained, not without great reluctancy of the Corporeal Soul, the Animal Spirits being for a long time forced, and restrained, become at length more fixed and *Melancholick*.

How from the
Spleen.

Thirdly, It is a common opinion, and also ours, that sometimes *Melancholy* is either primarily excited, or very much cherished from the Spleen, being evilly affected, and so from thence is called by a peculiar word, *Hypochondriack*; as we have shewed at large in another Tract of Convulsive Diseases. But the Blood is first in fault, begetting

ting in it self from the beginning *Melancholick* foulnesses, depofes them in the Spleen, which receiving again, after their being exalted into the nature of an evil Ferment, is more vitiated in its disposition, by their foulness.

Fourthly, But besides, it is said, there is another kind of *Melancholy*, distinct from the *Hypochondriack*, and the former, that is begotten in the whole Body together; this is nothing else, than the Mass of Blood being degenerated from its true nature, by reason of errors in the six non-naturals, and for many other occasions, doth acquire an *Acrabillary* or *Melancholick* disposition; that is, where the Spirit being depressed, the *Sulphureous* Particles, together with the *Saline*, and also with some *Earthy*, are carried forth; for the *Melancholick* disposition of the Blood is very much a-kin to this *Sulphureous-saline*, which we have shewed oftentimes to excel in some kind of *Scurvy*. For what causes, and upon what occasions, this is wont to be produced, may be sufficiently known from the *Ætiology* of that Disease, being at large explained.

The differences of this Disease may be easily gathered from what hath been said: for in respect of its first subject, which is sometimes the Soul, sometimes the Body, or rather the Blood, it is called either Animal or humeral *Melancholy*. Again, it is impressed according to that, with various powers, to wit, it is first impressed either on the Rational Will, or the sensitive, concupiscible, or irascible Appetite; also it is divided into very many kinds, as it is employed about diverse things, to wit, either Sacred, or Magical, or Humane, the huge cense or bead-roll of which is almost infinite; the chief of which, that are wont to come within the Cure of Medicine, are Religious, Amorous, and Jealous *Melancholy*.

2. By reason of the temperament of the sick, according to which, the Particles of the *Melancholick* blood, being made sometimes *Sulphureous*, sometimes *Saline* or *Earthy*, the Spirituous being depressed, are exalted more or less, a *Delirium*, or sadness, fury, or stupidity, are more or less variously joined to *Melancholy*.

3. The Disease is either continual or intermitting, according to the conjunct cause, either stronger, both the *Hypostasis* of the Spirits, and also the bloody Mass, being both together vitiated; or else lighter, and less deeply fixed; so that the Distemper'd sometimes are well enough for many days or months, yet apt to relapse upon any great occasion.

4. In respect of the hurt Imagination, there are very many types of *Melancholicks* to be met with, yea almost innumerable; yet the chief difference of which is, that some are delirious in all things, and others in one thing only.

The *Prognostick* of this Disease, though as to health or death, it is for the most part safe; yet by reason of the event, it is very uncertain: For some quickly grow well, others not of a long time, and others are never cured.

This Distemper suddenly excited, from a solitary evident cause, as a vehement Passion, is far safer than by leasure invading, after a long *Procatarxis* or foregoing cause. For the former, if the evident cause be presently removed, often ceases of its own accord, or with a little help; but in this latter, for that the Mass of Blood, and the whole heap of Animal Spirits, are departed from their due disposition, and not rarely the conformation of the Brain, as to the tracts of the Spirits, is altered; The Cure very difficultly, and not under a long time succeeds.

Melancholy being a long time protracted, passes oftentimes into Stupidity, or Foolishness, and sometimes also into Madness; further, sometimes it brings on Convulsive Distempers, or the *Palsie*, or *Apoplexy*, yea sometimes a violent Death.

As to the Cure, there is little or no hopes, if the Distemper'd being very contumacious and refractory, reject all Medicines, and every method of Physick. Further, there is scarce any better thing to be expected from them, who lying sick with only imaginary Diseases, take all Remedies, and require still more, and of diverse kinds, to be given them.

As the Cure of *Melancholy*, as it is always difficult and long, so it is wont to be mighty intricate and perplexed; for that it ought to be diversly and variously instituted, in respect of the evident, *Procatartick*, and Conjunct causes of its kind, also by reason of the *Symptoms* daily arising. Neither is it only behoveful oftentimes to change the Remedies, and Method of healing, but also variously to make use of between whiles, warnings, deceits, flatteries, intreaties, and punishments.

But first of all, the Evident Cause of this Disease, if any noted thing went before, should be inquired into; and if it may be, either presently removed, or else its removal to be in some sort feigned. Further, the affections of the mind being vehement, and stirred up from thence, are either to be appeased, or subdued by others opposite. Wherefore, to desperate Love ought to be applied or shewed indignation and hatred; Sadness is to be opposed with the flatteries of Pleasure, Musick, a desire of vain glory;

or also a *pannick* terror. In like manner, as to the rest of the Passions, you must proceed to quiet, or elude them.

Three primary Indications.

The *Curatory* Method, accommodated for the healing of *Melancholy*, suggests many other Indications, the chief of which, and to which the rest may be the better placed, are these three, commonly noted, *viz.* *Curatory*, which respects immediately the Disease, and its Conjunct Cause; *Preservatory*, which cuts off the *Procatartick*, and Evident Causes; and *Vital*, which is employed about conserving of strength.

I. *Curatory*.

As to the first Indication, the intention of the *Physician* is so much to lift up, make volatile, and corroborate the more fixed or dejected Animal Spirits, that being also apt to go backwards, or out of the way, that afterwards they may irradiate more freely, being stretched forth, the whole Brain, with a full and not broken beam, for the Acts of the Imagination, Judgment, and other principal faculties; and so lively actuate the *Præcordia*, and make them to vibrate or beat strongly, that the Blood being more plentifully inkindled, it may be projected from thence, without stop or stagnating, into the whole Body.

The healing of the Spirits, is best performed by admonitions and artificial inventions, concerning the business of Life.

Therefore, for the healing of the Spirits, first of all it is to be procured, that the Soul should be withdrawn from all troublesome and restraining passion, *viz.* from mad Love, Jealousie, Sorrow, Pity, Hatred, Fear, and the like, and composed to cheerfulness or joy: pleasant talk, or jesting, Singing, Musick, Pictures, Dancing, Hunting, Fishing, and other pleasant Exercises are to be used. They who care not for Sports or Pleasures (for to some *Melancholicks* they are always ingrateful) are to be roused up by employing them in more light businesses; sometimes *Mathematical* or *Chymical* Studies, also Travelling, do very much help; moreover, it is often expedient to change the places of habitation, in their native soil. Those who will still stay at home, are to be warned, that they take care of their Household affairs, and that they should govern their Family; that they should build Houses, plant and order Gardens, Orchards, or Till the Ground. For the mind being busied with necessary cares or duties puts aside, and at last deserts more easily, vain and mad cogitations. *Melancholy* persons are seldom to be left alone, for that then they indulge their airy phantasies and speculations, and suffer them to continue longer. The Soul sinks down inwardly, and leaving the body, enters into a certain *Metamorphosis*, and puts on a new shape, and oftentimes different from humane manners. Wherefore, the Distemper'd ought to be disturbed almost always with the discourses of their familiar Friends; to wit, that the Animal Spirits, being called outwards, may be solicited from their diversions, into their former and accustomed tracts. But if the sick be seduced with phantastical illusions, and imagine some prodigious things of themselves, and firmly believe them; their mind is to be drawn from them, by artificial inventions; very many causes and examples of this sort of Cure are to be found in Books, and a discreet Physician may institute the like as occasion serves.

Yet oftentimes there is need of Medicine besides.

The *Preservatory* indication, concerning the *Procatartick* Causes of the Disease.

Although a fresh *Melancholy* may be cured sometimes by the mere discipline and institution of the mind and Animal Spirits, yet in a long or inveterate, where the Spirits have contracted an acetous nature, and the Blood an *Atrabilary* or *Melancholick* disposition, and that the Brain is hurt, as to its Pores and passages: other Indications called *Preservatory* are required, for the taking away of the *Procatartick* causes. Concerning this thing, the Medical intentions are first, that the Blood be reduced to a better temper, and genuine, to wit, a spirituous saline; then to enliven the Brain, and to render it bright and clear, its Pores being unlocked; and also to corroborate the Animal Spirits, and to excite them into a lively flowing forth. For which ends, the following method I think good to propose, which notwithstanding ought to be varied, according to the various constitutions of the sick.

Phlebotomy.

The taking away of Blood has place almost in all *Melancholicks*, and sometimes it is often to be iterated. For the adust and lifeless Blood, being at times drawn away, a new and more spirituous comes in its place. Concerning the quantity, place, and manner of celebrating this Remedy, Authors have various opinions; but the motion and the affections of the Blood, being truly weighed, it will at first suffice to take a moderate quantity out of the Arm, and afterwards if need be, a lesser, or to draw it from the Sedal Veins by Leeches. How the *Salvatella* Veins being opened (as is said) should bring such notable help to *Melancholicks*, I confess I cannot understand: perhaps it may help them, if the *Melancholick* persons be firmly perswaded; that this *Phlebotomy* will cure them before any others: the frequent opening the *Hæmorrhoidal* Veins, invites Nature to an endeavouring afterwards for that evacuation, which succeeding of its own accord (as *Hippocrates* says) does not seldom Cure this Disease.

Purgings, for that it draws back the nourishment of the Disease, from the firsts ways, and removes the impediments of other Remedies, ought to be celebrated at the beginning,

nings, and repeated at intervals. But that some think, for the sooner rooting out of this Disease, *Hellebore* or *Elateriums* are chiefly to be used, and cite *Hippocrates* for their Author; we apprehend, if the success be minded, those things do not ordinarily agree with, yea more often do hurt to the sick: For indeed, more strong Purgers do not take away the cause of the Disease, to wit, the *Dyscrasie* of the Blood, but rather encrease it; besides, they more debilitate and strike down the Animal Spirits, before dejected. But *Hellebore* was so often prescribed by *Hippocrates*, because in his Age other Catharticks were scarcely known, or at least they were not in frequent use. But now it is thought much better, gently to draw forth the receptacles of the humors, by more gentle and easie Purgers, and to cleanse only the Viscera and the first ways, without any great commotions of the Blood and Spirits.

Vomiting Medicines (as in most Cephalick Diseases free from a Feavour) are wont to Vomiting. help after a peculiar manner in all mad Distempers. The reason of this partly consists in this, because the viscous load of the Ventricle, which (as we have elsewhere shewn) doth very much burthen the Soul, being purged forth, the Spirits by that means being more free, expand themselves more lively and chearfully. Further, forasmuch as Vomiting presses together and evacuates the neighbouring receptacles of the humors, to wit, the Gall-Bag, the passage of the *Pancreas*, and the *Glandulas* of the *Mesentery*, procures that their contents be not transferred into the Head.

Take *Oxymel of Squills* one ounce and a half, of *Wine of Squills* one ounce, of the *Syrup Vomitorius de Peto* two drams; mix them, and make a *Vomit*: if it doth not work, or but slowly provoke Vomiting with a great deal of *Carduus Posset-drink*.

Take of the *Decoction of the middle bark of Elder* four ounces, of the *Salt of Vitriol* one scruple to two scruples, of *Oxymel simple* three drams; mix them, and take it after the same manner.

To robust and well-set persons may be given of the *Infusion of Crocus Metallorum*, or of *Mercurius Vite*, also the *Emetick Tartar of Mynsicht*, or the *Sulphur of Antimony*.

Take of the *Root of Polypodium of the Oak* half an ounce, of *Epithimum* three drams, of *Purgers Sena* half an ounce, of *Tamarinds* six drams, of the seeds of *Coriander* three drams, of *yellow Saunders* two drams; let them be boiled in fourteen ounces of *Spring-water*, till it comes to ten ounces; adding to the Colature, or when it is strained, of *Agarick* two drams, of *Rhubarb* one dram and a half, being clarified, add of the *Syrup of purging Apples* two ounces; let six ounces be taken, and repeated within three or four days.

Take of the best *Sena* three drams, *Epithym*, *Rhubarb*, each one dram and a half; of *Yellow Saunders* half a dram, of *Coriander seed* two scruples, of the *Salt of Wormwood* half a dram, of *Celtick Spike* a scruple; put these into white *Wine*, and the *Water of Pipins*, of each four ounces, kept close all night; to the liquor being strained five ounces, add of the *Syrup of Epithimum* six drams, of *Aqua Mirabilis* two drams; mix them and make a *Potion*. In strong bodies or hard to work on, may be added to these, of the strings of black *Hellebore* macerated in *Vinegar* one dram or two.

For those who had rather make use of Pills, Boluses, Powders, or Syrups, take the following.

Take of *Pil. Tartar of Quercitan*, or of *Amber of Crato* half a dram, of the *Resine of Pills Jalap* or of *Scammony* six or eight grains, of *Tartar vitriolated* half a scruple, of *Ammoniacum* dissolved in *Aqua Mirabilis*, what will suffice to make a *Pill*: let four be taken going to sleep, and unless they work first, one in the morning following.

Take of *Calamelanos*, of the extract of black *Hellebore*, each one scruple; of the *Resine of Jalap* six grains, of *Ammoniacum solut.* what will suffice; make four *Pills*, let them be taken with Government.

The *Powder of Haly*, the *Powder of Valesco de Tarenta*, of *Peveda* and others, are very Powders, much commended. And indeed in Country bodies, or robust, this Cathartick may seem convenient. Take of *Epithimum* half an ounce, of *Agarick*, *Lapis Lazuli*, each three drams, *Scammony* one dram, *Cloves* thirty; make a *Powder*: the Dose is from half a dram to a dram.

Take of the *Powder Diasenna*, of *Diaturbith* with *Rhubarb*, each half a dram; make a *Powder*: let it be taken in a draught of *Posset-drink*, in a *Decoction of Epithimum simple* four or five scruples.

Take of the best *Senna* two ounces, of the *Roots of Polypodia of the Oak* two ounces, of *Syrups Epithimum* one ounce and a half, of *yellow Citrons* half an ounce, of *Tamarinds* one ounce, of *Coriander seeds* six drams, boil them in *Barnet water* four pints, till half be consumed,

strain it, and let it be evaporated in a warm Bath, to the consistence of a Syrup, adding towards the end, of pure Manna, and of white Sugar, each four ounces; make a Syrup: the Dose is two Spoonfuls or three, in three ounces of some convenient distilled water; or in any other liquor. Or,

Take of the same liquor evaporated to the consistence of Honey six ounces; of fresh Cassia four ounces; of the jelly of Currans two ounces; of Cream of Tartar, of the Sale of Wormwood, each one dram and a half; of the Powder of Diasen. two drams; of yellow Sanders powder'd two drams; mix them and make an Electuary: Dose three drams to half an ounce.

Altering Medi-
cines are of the
greatest mo-
ment;

Purging is not to be used continually, nor too frequently, yea it suffices that it be administered within six or seven days space, and at other times, let the belly be taken down by Clysters, if it be bound. As to other Medicines, which are not evacuators, though the Ancients relied not much upon them, we put our greatest confidence of Cure in them. For they (to whom also many moderns consent) thought there was nothing more to be done for the curing of Melancholy, than to Purge forth the Melancholick humor; wherefore, making Purges their chiefest business, they instituted the other Medicines called Preparatory, only for the sake of this, to wit, making it their scope, that as soon as the humor being reduced to a fit-consistency, by Altering Medicines, and that the ways for its extretion were open enough, then that it should be carried forth of doors by Purgers. Which kind of Hypothesis seems not agreeable, neither to reason, nor to Medical experience; because Melancholick people rather receive hurt than help by often Purging, how methodically soever it be instituted. Therefore, we, placing the cause of this Disease in the Dyscrasie of the Blood and Spirits, and in the weakness or evil conformation of the Viscera and the Brain, esteem altering and corroborating Medicines to be in the first rank for Remedies, and for the sake of these, that Purgers may be used sometimes between whiles. Therefore Purging being rightly prescribed at due intervals, for the removing impediments, as to the rest you may proceed according to these forms.

and not purging
Medicines, as
the Antients
thought.

An Electuary.

Take of the Conserves of the flowers of Gilliflowers, and of Borage, each two ounces and a half; of the rinds of Myrobalans preserved six drams; of Coral prepared, and of Pearl, each one dram and a half; of Ivory, and Crabs Eyes, each one dram; of Confection de Hyacinth two drams; of the Syrup of Coral and red Poppy what will suffice; make an Electuary: take two drams Morning and Evening, drinking after it three ounces of the following Julep, or the distilled Water.

A Julep.

Take of the water of the Flowers of Cowslips, and of black Cherries, each six ounces; of Balm four ounces; of Dr. Stephens his Water two ounces; of Sugar six drams; mingle it and make a Julep.

A Distilled Wa-
ter.

Take of the leaves of Balm, Borage, Bugloss, Fumitory, Water-Cresses, and Brooklime, each four handfuls; of the flowers of Pinks, Marigolds, Borage, and Cowslips, each three handfuls; the outer rinds of six Oranges and six Lemons, being all cut and bruised, pour to them Whey made of Cyder eight pints; distil it in a common Still, and mix all the liquor together.

Lozenges.

Take of the Powder of Pearl, of Ivory, of Coral prepared, each two drams; of the Species Latifcant (or making merry) of Diarrhod. Abbatis, each one dram; of the Oyl of the rind of Citrons half a scruple; of white Sugar, dissolved and boiled to the consistence of Lozenges, in what will suffice of Balm Water, six ounces; make Lozenges according to art, weighing a dram: take two or three at nine of the Clock in the Morning, and at five in the Afternoon, drinking after it a draught of the distilled Water or of Tea. Or,

An Apozem.

Take of the Roots of Chervil, of Polypodium of the Oak, each one ounce and a half; of the leaves of Harts Tongue, Ceterach, Scolopendria, Germander, each one handful; of Tamarisk half a handful, of the bark of the same half an ounce; of Raisins of the Sun stoned two ounces, one Apple cut; let them be cut and bruised, and boiled in four pints of Spring-water, to the consumption of a third part; about the end add of the leaves of Water Cresses one handful, let it be strained and clarified: take of it six ounces twice or thrice in a day; sweeten it with Syrup of Fumitory.

Spaw-Waters.

Spaw Waters coming from Iron, are wont oftentimes to give great benefit for the Curing of Melancholicks, to wit, because they being plentifully drunk, wash out salino-sulphureous Tincture of the Blood, and destroy its evil ferment. Moreover, they wipe clean the filthiness of the Viscera, unlock obstructions, and what is of great benefit, they corroborate, by their astringtion, both the weak and too loose Viscera, and also shut up the little mouths of the gaping Vessels of the Brain, by which a passage lay open into

into it for the extraneous matter, together with the nervous juice. And for this reason, to wit, by corroborating the Viscera, and by locking up the passages of the Head, *Vitriolicks* prepared of Iron are wont to be given profitably in *Melancholy*, and also in the *Vertigo*.

Take of our Steel prepared three drams, put it into a quart of the Water above described, chalybeates. Take of it three or four ounces twice in a day, by it self, or with any other solid Medicine.

Take of the filings of Iron one ounce, put it into a glass with the juice of Oranges two ounces; Steeled Medicine let it stand for a day, shaking it sometimes, then pour to it of the Water of Pipins, and cins. of White Wine, each one pint; or of the more thin and sweet Cyder one quart: take of it three ounces, twice in a day, after the same manner.

Take of the *Vitriol of Steel*, of the Cream of Tartar, of Crabs Eyes, each one dram; mix them; make a Powder, and let it be divided into nine parts: Take one part every Morning in a draught of the distilled Water, or the Decoction, or in a proper Broth.

Take of the Syrup of Steel four ounces: take of it one Spoonful twice in a day, in a proper Vehicle.

Take of the Extract of Steel, of our Steel prepared with a proper Decoction three drams, of the Powder of Ivory, of yellow Saunders, of Lignum Aloes, each half a dram; of the Salt of Tartar two scruples, of Ammoniacum dissolved in the Water of Worms what will suffice to make a mass; let it be made into small Pills; let three or four be taken every Evening, drinking after it three ounces of the water of Apples, or of Cowslip flowers.

Whey, if it agrees with the stomach, being drunk very plentifully, for many days, for the Whey. Same reason as Spaw waters, viz. by washing out the Salt, and Sulphureous particles of the Melancholick blood, is often given with success. Whey with Epithimum infused in it, or boiled in it, is highly praised by some.

Let Broths be made of a boiled Pullet, with the roots of Polypodium, Chervil, Fenil, But chers Broom, and the leaves of Ceterach, Harts Tongue, Scolopendria, &c. take a draught of it in the Morning, and at five of the Clock in the Afternoon, in which dissolve of the *Vitriol of Steel* six grains, to ten of the Salt of Wormwood, and of the Cream of Tartar, each a Scruple.

The Juices of Herbs and their expressions bring sometimes notable help to the taking away Juices of Herbs. the Discrasie of the Blood. Take of the leaves of Borage, of Water-Cresses, each six handfuls; two Apples pared, the Pulp of two Oranges, and of white Sugar one ounce; let them be all bruised together, and pour to them of the best Cyder a pint and an half; make an expression very strongly, and let it be kept in a glass. The Dose is four ounces twice or thrice in a day.

In the Summer time, a Bath of sweet water, for that it wipes away the filth impacted in the Pores of the skin, and moves transpiration insensibly, is very profitable to some. A Bath.

Because Melancholick persons sleep but badly, and from long and frequent waking Hypnoticks become worse, therefore Anodynes, and sometimes the more gentle Hypnoticks (when there is need) may be prescribed to be taken late at night, for this end are convenient, a Decoction of Cowslip flowers, or of the leaves of Lettice, or the water of red Poppies, or the Syrup of the same: Further, Emulsions of the Seeds of the white Poppy, of the Syrup de Meconio, and others that are only agreeable and cherishing of the Spirits.

As there is an infinite Company of Melancholicks, as well as of Fools, therefore we shall illustrate our Hypothesis with two Examples only, in one of which the Disease begins from the sensitive part of the Soul, or the Animal Spirits; and the other from its Vital part, to wit, from the Blood.

Sometime since, a noted person about forty years of Age, of a florid countenance, The first History. chearful, and nimble about any business, being afflicted in his mind, by reason of a certain affair, and very much dejected, he became thereupon very sad, Melancholick, and with a dark and cast down countenance. When I went first to visit him, he complained of a manifold hurry and distraction of thoughts, which were so many, that he was busied in his Phantasie almost night and day continually, he lived without any sleep: Nor were these cares concerning the commonweal, or the proper business of his Family; nor about the health of his Soul, or of his Body, was he at all solicitous; but was rather troubled perpetually about small matters, and of no moment. He was so fearful of all things, that he presaged loss or death immediately to happen to him, upon every small accident. And lastly, he was so sad, as if he would contend in weeping with *Heraclitus*. Further, he laboured with such a straitness of Heart, and so great a constriction, that he seemed to feel all his *Præcordia* to be drawn together like a Purse, and

An Example of Melancholy beginning from the Spirits.

and he thought that there still lay there an immense burthen, and mighty weight, under which he imagined he could not go, unless stooping towards the Earth. Whilst he talked, and discoursed with his Friends, this constriction of the *Præcordia*, and the weight did somewhat remit; but then again, they were wont to be repeated more vehemently, shaking for fear at any unaccustomed object: Nor did he labour only in his *Præcordia*, but with a certain constriction in his whole Body besides, and as if a certain burthen lay on the region of his Loins, and also on his shoulders and arms.

The Cure.

The reasons of these Symptoms are clear enough from our *Hypothesis*. As to the Cure, after various Medicines being given, without any success, I at last perswaded, because it was then Summer time, that he should drink of our Artificial *Spaw Waters*, for a fortnight: Therefore, first two quarts of Spring-water being poured upon half a dram of our prepared Steel, for a night, and afterwards as much in four quarts of water; the sick man every morning drunk the clear liquor, and within four or five hours he rendered the greatest part of it by Urine: He took besides, going to sleep and early in the morning, a Dose of an appropriate *Electuary*, (such as is above described) with a *Cephalick Julep*; within two months he became much better, and afterwards by degrees returned to himself.

The second History.
An Example of Melancholy arising from the Blood.

Whilst I was writing these, a young Noble-man, being lately returned from his Travels beyond Sea, and becoming unhealthy, put himself upon our care. This person being formerly indued with a Sanguine and chearful temperament, splendid in his appearance, as also with an acute wit, and of a ready ingenuity, whilst he travelled in the Countries abroad; but one Summer living in *Spain*, he felt a great alteration in himself, from the great heats in that place: for first of all, from the frequent heatings of his Blood, he became obnoxious to an heat arising in the palms of his hands, and in the bottoms of his feet, with prickings over all his body, which in a short time vanished. Then he found himself very bad as to his Appetite and Sleep; moreover being dull and sad, he began not to mind, yea sometimes to avoid any pleasant business, or the converse of his Friends. At length his indisposition daily increasing, without any evident cause, or real trouble of mind, he became *Melancholick*, so that being ever thoughtful, fearful, and sad, nothing could delight him; for his studies, exercises, travelling, conversation with learned men, or any other thing which he before delighted in, now became to him a trouble and a terror. After this manner being distemper'd for two years, he was so changed from himself, as if he were another Man. For his Cure he had consulted the most skilful Physicians in *Spain*, *France*, and *Holland*, and lastly in *England*, and had tryed several methods of healing almost without any benefit. The *Melancholick* distemper of his blood, at first contracted by the intemperature of the Air, still remaining, and afforded to the Animal regiment, Spirits as it were acetous, that is such as we but now described. To this Noble man, at the beginning, we thought good to recommend these following Remedies.

The Curatory Method proposed.

Take of the Decoction of *Senna Gerionis* (with *Tamarinds* half an ounce) four ounces, of the Syrup of purging Apples one ounce, of *Aqua Mirabilis* two drams; mix them, and take it with government, repeating it within nine days. After Purging let Blood be taken away with Leeches, about four ounces.

Take of our Syrup of Steel six drams, take a spoonful in the morning, and at five of the Clock in the Afternoon, in the following liquor three ounces, walking after it for an hour or two.

Take of the leaves of Balm, Borrage, Bugloss, Pimpernel, Elm-tree, Harts Tongue, Water-Cresses, each four handfuls; of the Roots of Borrage half a pound, of Pinks and Marigold flowers, each three handfuls; the outer peels of eight Oranges and four Lemons, of Mace half an ounce; these being cut and bruised, pour to them of Whey made of Cyder eight pints; let them be distilled in common Stills.

Take of the Conserve of Gilliflowers, Betony, Borrage, each one ounce and a half; of Pearl powdered two drams, of red Coral prepared one dram and a half, of the Species Confect. de Hyacintho two drams, of the Syrup of Coral, and red Poppies, each, what will suffice: make an Opiate to be taken going to sleep every night, the quantity of a Chestnut, drinking after it of Cowslip flower water two or three ounces.

After sixteen or twenty days, changing the method of altering Medicines, the following things were used in their places.

Take of the Powder of Ivory, Pearls, red Coral prepared, each two drams; of male Pæony roots one dram and a half, of the Wood Aloes half a dram, Lozenges made out of Oranges four ounces, of the solution of Tragacanth made of Balm Water, what will suffice: make Troches weighing half a dram: let him eat four in the Morning, and at five in the Afternoon, drinking after them a draught of Tea.

Take

Take of the same Powder without the Lozenges half an ounce, of the flowers of Sal Armoniack, and of Salt of Coral, each one dram; with Turpentine of Chio six drams, make a Mass: take half a dram Evening and Morning, drinking after it of the distilled water three ounces.

His food was only good and easily digested meats: he drank small Ale, with the leaves of Harts-tongue infused in it. He tasted sometimes a little Water and Wine, or Cyder, and he was almost continually employed, sometimes in some easie affairs, sometimes in moderate exercises, or in several sorts of recreations.

Thus much concerning universal *Melancholy*, by which the sick are affected almost indifferently by any object, so that they are intangled in every place, and by any accidents and circumstances, with a multitude of thoughts continually, with raving, fear, and sadness. We have largely enough handled the *symptoms* of this Disease being manifold, and the reasons of them, partly in this Chapter, and partly in another Tract.

Universal Melancholy.

De Morbis Convulsivis, Cap. 2.

Particular Melancholy,

It is called special *Melancholy*, when the sick respect a certain particular thing, or some kinds of things, of which they think almost without ceasing; and by reason all the powers and affections of the soul being continually imployed about this one thing, they live still careful and sad; moreover, they have absurd and incongruous notions, not only about that object, but also concerning many other accidents and subjects. In this Distemper, the Corporeal Soul, bending from its proper kind, assumes a certain new one, but not being conformable, either to the Rational Soul, or to the Body, or to it self, it enters into a certain *Metamorphosis*.

This kind of Distemper, is produced by many ways, and on various occasions; for vehement passions, desire, fear, anger, pleasure, yea all other passions both of the concupiscible and irascible Appetite, being long continued, and carried forth to the height, are wont to excite the same. But there are two general occasions, from which special *Melancholy* chiefly and most frequently doth arise; to wit, first, when there lyes a most heavy pressure on the mind of some present evil, or an evil just at hand, whether it be true or imaginary: or secondly, if the loss or privation of some good before obtained, or desparing of something wished for or desired, happen. In these opposite cases, the Corporeal Soul being either drawn forth outwardly, omits all domestick care, either of it self, or of the Body, or of the Rational Soul: or being pressed inwardly, it relinquishes or perverts the offices of Reason, and of both the Vital and Animal Functions. It would be an huge work to enumerate the various cases in either kind, and their ways of affecting; out of the great plenty, which being of the greatest moment, seem to require the care of a Physician, are chiefly *furious Love, Jealousie, Superstition, despair of Eternal Salvation*, and lastly the *imaginary Metamorphosis* of the Body or its parts; and the good and evil phantasticks of fortune; of these, severally, we shall speak briefly.

is excited by reason of two sorts of Affections concerning Good or Evil.

Concerning the power of Love, saying nothing here of some most noble Lord, or Heroick actions, (which appear chiefly on the stage of the Theatre, and on that of humane life) it is a most common observation, that if any one being taken with the aspect and conversation of any Woman, begins to desire her and to grow mad for her inwardly, and for his most devoted affection has nothing but loss and contempt allotted him, unless he be very much supported by a firm reason, or is averted as it were by other cross affections, there is great danger lest he falls into *Melancholy, Stupidity, or Love-Madness*; with which passion, if by chance he be distemper'd, he forthwith seems transformed from himself, as it were into an animated statue, he thinks on, nor speaks of any thing but his Love; he endeavours to get into her favour, with the danger of both the loss of his Life and Fortune; in the mean time, he not only neglects the care of his household affairs, or of the publick, yea his own health, but becoming desperate of his desires, he ostentimes lays violent hands of himself: But if he be content to live, yet growing lean, or withering away both in Soul and Body, he almost puts off man; for the right use of reason being lost, omitting food and sleep, and the necessary offices of Nature, he sets himself wholly to sighing and groaning, and gets a mournful habit and carriage of body.

Love-Madness.

If we should inquire into the reason of this Distemper, it easily appears, that the Corporeal Soul of Man being obnoxious to violent affections, when it is wholly carried into the object most dear unto it self, viz. the beloved Woman, and cannot obtain and embrace her, there is nothing besides that can quiet or delight it; yea being refractory, it grows wholly deaf to the Rational Soul, and hears not its dictates, but carrying only tragical notions to the Imagination, darkens the sight of the intellect. Further, so far as the *Præcordia* (the more plentiful afflux of the Spirits being

The Reasons of Symptoms in mad Love.

ing denied to them) do slacken of their motions, the blood heaped up in the bowels of the heart, and apt to stand still, stirs up a great weight and oppression, and for that reason, sighs and groans; in the mean time the face, and the outward members grow pale and languish, for that the affluence of the Blood and Spirits is withdrawn: Hence in our *Idiom* or Speech, the Heart of despairing Lovers is said to be broken, to wit, because this Muscle is not lively enough actuated by the Animal Spirit, and so is shaken weakly and slowly, and doth not amply enough cast forward the blood with vigor, into all parts. Indeed in Love, the Corporeal Soul intimately embracing the *Idea* of its most grateful object, endeavours all it can to be joyned, and fully united to the same; emitting toward her, the roots of the affections, with which it is most strictly enfolded, seems from thence to draw its chiefest life and growth; so that the body being neglected, when as it inclines it self wholly towards the thing beloved, if by chance being broken off from this union, it suffer a divorce, like a plant taken out of its natural soil, for that it does not receive any more, or assimilate food convenient for it self, it soon withers: Hence the Animal Spirits leaving their accustomed offices, and wonted tracts of expansion, do not actuate or irradiate either the Brain or the *Præcordia*, nor the nervous *Appendix*, after their due manner: wherefore, not only for the present an untrimmed, and a delirious disposition of mind, with a mournful habit of body, are excited; but from thence the vitiated Blood; and the Spirits, having gotten an acetous nature, an habitual *Melancholy* is introduced.

Jealousie.

Such an inordination of the Animal Function as Mad-Love hath, about the acquisition of its object, the same or very like hath *Jealousie*, about the retention of the same, being gotten; so always (as well in the fruition as in the desire) *Res est solliciti plena timoris. Amor: Love is ever full of careful fear.* This Soul, if it be not secure of its most dear prey, it presently grows hot, and pours forth darkness and clouds upon its own serenity: Then afterwards being infected by a *Cholerick* tincture, it receives every object, as if it were imbued with a yellow colour: for indeed, as the ferment of the stomach being too much indued with a sourness, perverts all things that is put into it, into its nature; so *Jealousie* being once arisen, changes all accidents and circumstances, into the food of its poison; and when the sensitive Soul, being as it were bowed inward in this passion, becomes not conform to its Body, for that reason the *Oeconomy* of the Functions both Animal, Vital, and vegetative being depraved, *Jealousie* makes one rave, and to wither away.

*Superstition
and Desperation.*

Superstition, and a despair of *Eternal Salvation*, are wont to impress on the sensitive Soul, the Blood, and the Body, almost the like Distempers of *Melancholy*, as *Love* and *Jealousie*; but their way of affecting is somewhat different: for in those the object, whose acquisition or loss is indanger'd, is wholly material, and its affection being at first conceived by the Rational Soul, is impressed on the other Corporeal: In the prosecution of which, if she easily obtains her desires, then no perturbation of the humane mind arises; but if (as it often is wont to happen) the Corporeal Soul being oppugned or refused, it will not stand to the monitions of the Rational, but presently growing hot, moves inordinately the Blood and Spirits, opposes the Corporeal goods and blandishments to the spiritual objects, from the intellect, and endeavours to draw the man to its side; and so whenas there is a continual skirmish between the two Souls, and that sometimes the superior Will, and sometimes the sensitive Appetite prevails; at length the judgment seat of the Conscience is erected by the mind, where every several action is scrupulously examined. By reason of this more frequent strife of the Souls, the Animal Spirits being too much and almost perpetually exercised, and often commanded, and as it were drawn hither and thither into contraries, at length they depart something from their vigor and their nature, and at length being made more fixed and Melancholick, for that they are detained from their wonted expansion, cut unaccustomed and by-tracts in the Brain, and so induce a *Delirium* or idle raving, with mighty fear and sadness. In this sort of Distempers, the Corporeal soul being snatched as it were violently, departs both from it self, and from the Body, and according to the characters of the impressed *Idea* being modified, it is wont to assume a new image, either Angelical or Diabolical; in the mean time, the Intellect, because the *Imagination* furnishes it only with undecent and monstrous notions, is wholly perverted from the use of right reason.

*The reason of the
Symptoms.*

*The imaginary
Metamorphosis
of Melancholick
Persons.*

By the like means of affecting, it happens that some *Melancholick* persons undergo imaginary *Metamorphoses*, as to their fortunes, or as to their bodies, viz. whilst one imagines himself, and plays the part of a Prince, and another a Beggar; another believes that he has a Body of Glass, and another that he is a Dog, or a Wolf, or

or some other Monster; for after the Corporeal Soul's being distemper'd with a long *Melancholy* and the mind blinded, it wholly departs both from it self, and also from the Body, and affects, and as much as in it lyes, truly assumes a new image or condition.

C H A P. XII.

Of Madness.

After *Melancholy*, *Madness* is next to be treated of, both which are so much akin, that these Distempers often change, and pass from one into the other; for the *Melancholick* disposition growing worse, brings on *Fury*; and *Fury* or *Madness* growing less hot, oftentimes ends in a *Melancholick* disposition. These two, like smoke and flame, mutually receive and give place one to another. And indeed, if in *Melancholy* the Brain and Animal Spirits are said to be darkned with fume, and a thick obscurity; In *Madness*, they seem to be all as it were of an open burning or flame. But indeed, for that as we have already shewn, that the Animal Spirits being inkindled or inflamed do excite a *Phrensie* with a *Feavour*, which is wanting in *Madness*, their affection will be better illustrated in this Disease, as well as in *Melancholy*, by the *Analogy* of *Chymical Liquors*.

Whenever therefore *Madness* without a *Feavour* being excited, with a remarkable hurt of the animal Function, is wont to be permanent, and continue long, its next and immediate subject are the Animal Spirits; which acting not by consent, nor from any force from another, but of themselves, are habitually distemper'd, and depart from their proper and genuine nature, to wit, a *Spiritual saline*, into a *Sulphureous-saline* disposition, like to *Stygian-Water*, as we have shewed above; therefore they perform only inordinate acts, and so persist a long while to act amiss or evilly. To this vice of theirs, perhaps the Brain, or the Blood, or other parts may contribute somewhat, but the Spirits themselves are first and chiefly in fault.

It is observed in *Mad men*, that these three things are almost common to all: viz. First, That their *Phantasies* or Imaginations are perpetually busied with a storm of impetuous thoughts, so that night and day they are muttering to themselves various things, or declare them by crying out, or by bawling out aloud. Secondly, That their notions or conceptions are either incongruous, or represented to them under a false or erroneous image. Thirdly, To their *Delirium* is most often joyned Audaciousness and Fury, contrary to *Melancholicks*, who are always infected with Fear and Sadness. These primary symptoms of *Madness* in the Animal Spirits, indued with the nature of *Stygian-Water*, may be thence most aptly deduced as appears clearly by what follows.

For first, the Particles of *Stygian-Water* are highly active and unquiet, and in perpetual motion; hence the Effluvia's falling from them continually strike the Nostrils, and the Liquor being poured forth from the Vessel, meeting with some other bodies grows very hot, and penetrates their Pores and Passages; the reason of which is, because the *Saline* Particles being conjoyned with the *Sulphureous*, shake one another, and will not cohere with any of another kind. In like manner we may suppose that the Animal Spirits being stilled forth from the Blood; filled as it were with a *Nitrous sulphur*, are indued with a notable mobility or unquietness; which, for that reason, being stretched forth from the middle of the Brain on every side; both in its compass and in the nervous System, and being from thence perpetually reflected, produce unbridled *Phantasies*, and almost never interrupted, and also great and perpetual inordinations, both of the sensitive and loco-motive function.

Secondly, the Effluvia's exhaling from *Nitrous* or *Stygian* Spirits, do not so much evaporate from open spaces, but being very penetrating, cut every where new ones, almost in every subject, where they are able to break thorow; yea most bodies containing these kind of Spirits, or the things laid upon the mouths of the Vessels, are so bored thorow by them, that they are presently rendred friable or brittle, and fall into small bits. In like manner we believe, that the Animal Spirits in the Distemper of *Madness*, becoming very moveable, and very much sharpened, out of their morbid nature, do so likewise leave their former tracts of going and returning to and fro, and do cut for themselves, every where in the Brain, new little spaces or walks,

Madness and Melancholy are akin.

The Subject of Madness are the Animal Spirits.

The disposition of which are like to Stygian Water.

Three chief Accidents in Madness.

which are also to be found in Stygian Water.

1. The Particles of this are always in motion.

And in like manner the Animal Spirits in Mad-men.

2. The Effluvia's of Stygian water, every where make new Pores and Passages.

In like manner also the Animal Spirits in Mad-men.

and plainly devious; in which, whilst they flow, they produce unaccustomed notions, and very absurd, whence there is a necessity, that the distemper'd do speak, and imagine for the most part incongruous and discomposed things; at once confounding things past with things present, or to come; and contrary or opposite things.

3. The Effluvia's of Stygian Water are diffused far.

Thirdly, It is observed, that the vaporous little bodies falling away from the Nitro-sulphureous Spirits of Minerals, do not only subsist in the neighbourhood, (as the breath exhaling from acetous Liquors) but are diffused very far, and on every side into remote places. I have often seen, when the Spirit of Nitre has been mixed with the Butter of Antimony, that the whole Chamber has been filled with a black smoke ascending from those Stygian Liquors: When Aqua fortis or the Spirit of Nitre being poured from the Alembick, or drawn forth by a gentle heat, a most sharp vapor has pierced the Nostrils and Lungs of those standing afar off; which certainly happens by reason of joyning together of the fluid Salt, and the raging Sulphur; the little bodies of either of which mutually incite one another, and so being combined together, are carried farther. Indeed, after the same manner it seems to be concerning the Animal Spirits in Mad-men, which, for that they are of the same nature as Stygian Water, quickly passing thorow both the frame of the Brain and its Appendix, cause the distemper'd not only to be furious, but as it were Demoniacs or possessed with the Devil; so that being free from any fear or languishing, they enter upon any thing boldly, and expose themselves fearless to sword or fire; also by reason of the prodigious putting forth of their Spirits, with a mighty strength, they often break asunder bonds and chains, and overthrow at once many strong men, resisting and going about to restrain them.

In like manner as the Animal Spirits in Mad-men.

What the Con-junct Cause of Madness is.

The comparing of the Animal Spirits with Stygian Water, or the Nitro-sulphureous Spirit, clearly shews what is the conjunct or immediate cause of Madness; to wit, which seems to consist, not so much in an adust bile or humor, or black and sharp vapour, being suddenly suffused into the Brain, and inciting the Spirits inhabiting it into rage and fury; (for such a vapour or humor either exhales of its own accord, or may be soon removed by the help of Remedies; and so the madness thence excited, would pass away as quickly and as easily as the Fury or Delirium produced by the eating of wild Parsnips) but rather raging Mad-men are habitually so made, because their Animal Spirits degenerate from a gentle and benigne nature, as also a subtil and very active disposition, to wit, a Spirituous-saline, into another more sharp, to wit, partaking of a fluid Salt, an Arsenical Sulphur.

How the Animal Spirits acquire a disposition like to Stygian Water.

As to what belongs to the more remote or antecedent causes of Madness, viz. by reason of which the Animal Spirits acquire a most sharp disposition; before we come to these, we ought to shew how, and by what reason or means, a certain Corrosive Latex or water (such as we suppose the Animal Spirits with its Vehicle to be) is begotten, and is able to subsist in the humane body.

It is shewed in the first place that corrosive and as it were Stygian Particles, are begot in the humane Body.

Truly, that most sharp humors are sometimes begotten in our bodies, plainly appears by many observations. We have elsewhere made mention of a Noble Man, grievously obnoxious to distempers of the Brain and Nerves, whose sweat (when he was in a fit) presently eat thorow his shirt, or made it so crumbling or friable, as if it had been dipt in Aqua fortis. It is an usual thing for some to render by Vomit oftentimes as it were a Vitriolick water, corroding the coats of the Oesophagus and the Palat. Further, Cancrous, Scrophulous, and Pestilential Ulcers, shew a most sharp humor, by which the flesh and Membranes are eaten, as it were with Aqua fortis, with a blackness poured on them. Further it is observed, that Corrosive Stagmas, not chiefly brought forth in the Blood, are affixed to the musculous flesh, or to the Parenchyma of the Viscera; but more frequently being procreated in the nervous liquor, being laid up with its Latex in the nervous parts, or their Emunctories, do produce Aposthums, and Pockey, Septick, and other foul and filthy Ulcers. For these are most often excited in the Glandulas, or near the Tendons, or Membranes; and when as the humor falling away from them is first thin and watry, and afterwards becomes black very stinking; and corrosive; it is a sign indeed, that the nervous Liquor it self is changed into that sort of putrefaction.

Wherefore the Nervous Liquor oftentimes becomes corrosive. Because the volatile Salt most easily degenerates into an acid and most sharp, with the acquired Sulphur.

It easily occurs, if the reason of these be inquired into, that the Latex watering the Brain and nervous Appendix, doth contain in it self, together with a subtil Spirit, great plenty of volatile Salt. Therefore, when this is so depraved, that the Spirit being depressed, the Saline Particles degenerate into a flux, and acquire to themselves little Sulphureous bodies, it becomes plainly Corrosive and Stygian. Wherefore, malignant humors and Ulcers chiefly happen in the nervous parts, and their Emunctories, and there are excited upon any light occasion (as when a small hurt happens to the Breast of a Woman, a Cancer follows) because, indeed, the nervous humor being hindered somewhere in its passage, doth there stagnate, presently the Spirit being depressed,

depressed, or flying away, the Saline Particles degenerating from a volatile to a sour nature, get to themselves soon after strange companions, and snatching either Earthy or Sulphureous little bodies, or of some other kind, begin to congeal into *Scirrhus*, *Serumous*, or *Cancerous* Tumors. And when after this manner, by the stagnating of the nervous Liquor, and by its getting an heterogeneous concretion, the Mine of a Tumor is blown up in some part, and the supplements of the same liquor are continually perverted into the like nature of viciousness; to which also happen, the *Melancholick* impurities, poured forth from the Blood, and other humors, which with their joined forces encrease the rage (even as when diverse Salts and Sulphurs are distilled together) and constitute in the distemper'd part, a *Septick* matter, and like to the *Escharotick* or crusting up of *Strygian* Water. According to this reasoning or *Etiology*, the irregularities of these kind of Tumors, as also the appearance of the Kings-Evil, are most aptly unfolded. If that the nervous Liquor so corrosive, and made degenerate, doth not grow into Tumors, flowing into the nervous Fibres, it is wont to cause here and there most cruel Pains and Cramps.

Hence the Reasons of Tumours and Ulcers in the Kings Evil and the Cancer, are given.

But as this Liquor of the Nerves, being depraved after this manner, stirs up the aforesaid Distempers in the nervous parts; so it is not difficult to conceive, that the same water, for that it is for a Vehicle of the Animal Spirits, flowing in the Brain, doth acquire, together with those Spirits, a Corrosive and as it were a *Strygian* nature, and for that reason excites Madness. The depravation of the Animal Spirits, together with the juice watering the Brain, or the disposition of Madness, is wont to arise after various ways and for diverse causes; but truly, for the most part this Distemper (as we have observed of *Melancholy*) begins either from the Spirits themselves, or else from the Blood.

Hence also the Madness of the distempered Spirits.

The Original of Madness either from the Spirits themselves, or from the Blood.

First, *Madness* beginning from the Spirits, arises sometimes from an evident solitary cause, as a violent Passion; sometimes also it proceeds from a foregoing cause lying in the Brain, as when it comes upon *Melancholy* or a *Phrensie*. We shall a little weigh the reasons of either case, and the various manner of their being made.

It begins for two occasions from the Spirits.

1. As to the former, when a vehement affection puts any one besides himself, that happens to be made thus; either because the Animal Spirits are too much overthrown, and hurried into confusion; or because they are elevated above measure, and endeavour to stretch themselves forth beyond their sphere.

1. By Reason of a violent Passion, by which

First, The Spirits are wont to be cast down by a violent and terrible Passion; so it often happens, that some being struck with a panick fear, by seeing a true or an imaginary Spectre or Ghost, afterwards fall into a perpetual Madness. Further, some by reason of some notable disgrace or repulse, others by reason of their hopes of obtaining their Love being suddenly and unthought of frustrated, and others by reason of a rash breaking their oaths or vows, and violated Conscience, being first highly troubled in mind, anon become Mad. The reason of which is, because the Animal Spirits being driven beyond their orders and wonted passages, and put into confusion, do make for themselves new and devious ways, which entering into, immediately they bring forth delirious *Phantasms*; in the mean time, the Saline Particles of the nervous juice, the spirituous being depressed, depart from their volatileness; and suffering a flux, assume to themselves the Sulphureous little bodies poured forth from the Blood, into the then weak and open Brain; From whence this Liquor, being most sharp like *Strygian* Water, and the Animal Spirits becoming fierce and very much incited, become furious.

They are either too much cast down,

Secondly, Sometimes the Animal Spirits, whilst they are too much elevated, almost after the same manner induce both to themselves, and the nervous juice, the mad disposition. Hence Ambition, Pride, and Emulation, have made some mad; the reason of which is, because whilst the Corporeal Soul swelling up with an opinion and pride of its own excellency, lifts up it self, and endeavours on every side to expand or stretch it self forth most amply, beyond the border or sphere of its body, the Animal Spirits being tumultuously called into the Head, will not be contained within their wonted bounds, but being there broken and diversly reflected, by reason of their too much excretion, are compelled into new and plainly devious tracts; wherefore, both they being thrust forth from the course of their proper emanation, and also the nervous Liquor, do quickly acquire a sharp and incitative Disposition, as was said but now, for that reason *Madness* follows.

Or elevated above measure.

Thus much concerning Madness, excited by reason of a solitary evident cause; but this Disease doth also arise from a *Procatartick* cause, preexisting in the Brain, and chiefly from *Melancholy* or the *Phrensie* going before; in that the Animal Spirits with the nervous juice being a little more exalted, and in this a little more depressed, acquire the disposition of Madness. As to the former, it is a vulgar observation, that sudden and great *Melancholy* is for the most part next to Madness: the reason of which is, because, when the

2. Madness beginning from the Spirits succeeds Melancholy, or the Phrensie.

Animal Spirits, together with the nervous liquor, degenerate into a sourness, are perverted, there only wants the accession of *Sulphur*, by which they afterwards getting a Stygian nature; may induce *Madness*; (as when an acid Liquor distilled out of *Vitriol* or Salt, by the addition of *Sal Nitrosus*, becomes *Aqua fortis*) but indeed, in a great passion of *Melancholy*, because the Spirits being disturbed, the passages of the Brain are too open, the *Sulphureous* Particles carried from the Bilous and Rancid Blood, find an easie entrance, and so the former sour or acid disposition, turns into a *Stygian* or *Maddish*. Hence it is observed, if any one of a more hot temperament, falls into a *Melancholick Delirium*, with fear and sadness, soasmuch as the *Sulphureous* Particles in its humors, are joyned to the Salts being depressed into a flux, that sadness and thinking at the beginning, very readily a short time after becomes madness. Secondly, for that also a *Phrensie* often ends in *Madness*, the reason is almost the same with the former, but inverted; to wit, because in a *Phrensie* the Spirits and the nervous Liquor becoming *Sulphureous*, and too much inflamed, afterwards burning forth, get to themselves *Saline* Particles, and so in like matter get a most sharp and as it were a *Stygian* nature; wherefore the *Feavour* then ceasing, the *Fury* becomes fixed and continual.

2. The disposition of *Madness*, hath no less frequently its roots in the bloody Mass, and is at length produced into act, to wit, when as the Blood being depraved, and becomes *Nitro-sulphureous*, it either perverts the nervous Liquor, as also the Animal Spirits, or supplies them but evilly. Which kind of taint of the Blood is either hereditary or acquired.

First, It is a common observation, that men born of Parents that use sometimes to be mad, are obnoxious to the same disease, and though they have lived above thirty or forty years prudent and sober; yet afterwards without any occasion or evident cause, they have fallen into *Madness*. The reason of which is, for that the Blood at that time bending from its due temper, by degrees into a *Nitro-sulphureous*, affords to the Head Animal Spirits, and also the nervous juice, participating (as hath been said) of a most sharp nature. We have formerly shewn, that in our Complexion, Elementary Particles do persist during life, apart from the secondary, afforded by nutrition, and have their times of crudity, maturity, and defection; wherefore we suppose, the morbid seeds do ripen into fruit, according to the periods of Ages. Further, we take notice, that oftentimes the fruits of Diseases of this kind, do remain ripening for a long time, or perpetually as long as life; yet sometimes falling off as it were of their own accord, do wither away; then sometimes in another tract of time, from the infection being left, new fruits do spring up, and by little and little rise up to their height. Wherefore, *Hereditary Madness* is sometimes continual, and sometimes intermitting; its fits are wont sometimes to come again after a shorter time, and sometimes after a longer interval.

Secondly, As the foregoing Cause of *Madness* sticking in the Blood, is oftentimes innate or original, so sometimes the same is by degrees begotten, either by an evil manner of diet, or by the suppression of usual evacuations, or by reason of a *Feavour* going before, or for some other causes, and at length being brought to maturity, breaks forth into *Madness*. It is an usual thing in great want of sustenance, that some poor people, being constrained to feed only on very disagreeing meats, and of ill digestion, become at first sad, with an horrid aspect, louring and dark, and a little after Mad. The *Hæmorrhoids*, and the after flowings of Women in Child-bed, being restrained in their flux, or some evil and foul running Ulcers being suppressed, dispose some towards this Disease. Further, those who originally, or by acquisition, are indued with a more sharp temper, and with fierce manners, and threatening countenance, by reason of the disposition of their Blood, being nigh to a *Nitro-sulphur*, are in danger to fall into *Madness*, from some strong evident cause.

Thirdly, Venomous Ferments being insinuated to the Blood and nervous juice, as first of all from the biting of mad Animals, or by the taking of some poisons, are wont to stir up *Madness*. Concerning the reasons of the former, we have proposed our conjectures in another place. Of late a very Noble Lady, and to be credited, told me from her own knowledge, that a certain Gentleman, having eaten at dinner time the tender leaves of *Wolfs-bane*, in a Salad with other herbs, in the Evening found himself ill, and complaining of a great uneasiness and agitation of his Blood and Spirits, he desired his Friends to send for a Chirurgeon to let him blood, or that otherwise he should grow Mad; which indeed, as he said, came to pass; for before he could be let blood, he fell into *Madness*, and dyed in a nights space: This kind of deadly Distemper so suddenly happened, for that this poison had not only perverted the Blood and Animal Spirits, as to their temper, but had slain or beat them down immediately, with its malignant Ferment.

Thus

1. By what means it comes upon Melancholy.

2. How upon a Phrensie.

2. The Original of Madness sometimes from the Blood.

1. It is either Hereditary.

The Reason of which is shewn.

2. Or acquired, and so either,

By reason of errors in the fix Non-naturals;

Or by reason of Poisons.

An History of a Mortal Madness, from eating the leaves of Wolfs Bane.

Thus much for the formal Reason, and Causes of *Madness*. The primary Symptoms of it, we have mentioned to be a *Delirium* and a *Fury*; the reasons of which appear clear enough from what has been already said. To these we may moreover add Boldness, Strength, and that they are still unwearied with any labours, and suffer pains unhurt, of which we will speak briefly.

Mad-men are not as *Melancholicks*, sad and fearful, but audacious and very confident, so that they shun almost no dangers, and attempt all the most difficult things that are. The reason of which is, because the Animal Spirits being very fierce and provoked, both fortifie the Imagination, that no object may seem greater or bigger than it is wont to be, and actuate also the *Præcordia* with vigor, so that they cast forth the Blood strongly and swiftly, and drive it forwards lively to the utmost borders of the Body. In this Distemper the Soul endeavours to be carried forth, and to leap beyond the compass or sphere of the Body, and so striving on every side, against the incursions of any exterior things, bears it self without fear.

Secondly, *Mad-men* are still strong and robust to a prodigy, so that they can break cords and chains, break down doors or walls, one easily overthrows many endeavouring to hold him. The certain cause of which is, because in the Blood and nervous juice of Mad people, are contained Particles as it were *Nitro sulphureous*, or otherways most sharp, and as it were *Stygian*; from whence the Animal Spirits are indued, or are strong with an *Elastick* or *Explosive* force, stupendous, great, and far beyond what's natural.

Thirdly it is observed, that *Mad-men* are almost never tired; for although by playing mad pranks, and striving many days and nights they strongly exercise their members, and live in the mean time without sleep or eating, yet they scarce languish at all, nor desist from their agonies for want of strength. Which without doubt comes to pass, for that the Animal Spirits, though very moveable and *Elastick*, are not however volatile and easily dissipable, but by reason of the *Saline* Particles being depressed from their volatileness into a flux, being joined with the *Sulphureous*, become firm and more fixed; and therefore continue longer in their activity. In like manner as we have observed in *Aqua fortis*, which though it be contained in a vessel that's open, perpetually sends forth very many Effluvia's, and yet still retains its substance unwasted, and its corrosive force, otherwise than the spirit of Wine or Blood, the virtue of which soon evaporates.

In the fourth place, almost for the same reason, *Mad-men*, what ever they bear or suffer are not hurt; but they bear cold, heat, watching, fasting, strokes, and wounds, without any sensible hurt; to wit, because the spirits being strong and fixed, are neither daunted nor fly away. Further, the blood having gotten a *Nitro sulphureous* *Dyscrasie*, is incapable of any other sudden mutation; wherefore, although insensible transpiration be hindred, and other usual evacuations suppressed, or the supplies of the nourishing juice degenerated, yet neither a *Catarrh*, nor *Feavour*, nor *Atrophy*, or evil digestion easily comes upon *Madness*. For in this Distemper, although the Particles of the Blood do greatly swell up, yet by reason of the abundance of Salt they do not conceive a *Feavourish* burning. Even as also *Aqua fortis*, though it grows very hot and burns other subjects, yet it self is not at all inflamed, but rather resists burning.

The differences of this Disease are easily gathered from what hath been before said; for first as to its beginning, it is either *occasional*, which sometimes quickly ceases, the evident cause being taken away presently; or *habitual*, depending upon a foregoing cause lying in the Blood, and that either *hereditary*, or *acquired*.

Secondly, by reason of the *magnitude*, *Madness* is either highly furious, that the distemper'd ought to be bound or lock'd up, lest they should attempt any mischief to themselves or others; or else it is more gentle, in which the sick, being conversant with others, abstain from any malice or hurt. Thirdly, In respect of time, *Madness* is wont to be long or short, continual or intermitting. Fourthly, As to the various kinds of *Deliriums*, the shapes or *types* of this Disease are almost innumerable; all which to run thorow, is neither possible, nor worth the while; but most commonly, the distemper'd are mad alike in all things, or else chiefly as to one particular thing, having their judgment concerning other matters for the most part right.

As to the *Prognostick* of *Madness*, if the distemper'd be not obnoxious to a *Feavour*, nor any other Diseases besides, nor easily hurt by external accidents the Disease is not mortal of it self; yet the Cure is very difficult, because there is made a great alteration in the Blood and Spirits, and the sick resist every method of healing, and are enemies to *Physicians* and to themselves.

If *Madness* be inveterate or hereditary, or is caused by the biting of a Mad Dog, it

The Reasons of the symptoms of Madness explained.

1. Wherefore Mad-men are audacious.

2. From whence their immense strength.

3. Wherefore they are never tired.

4. Wherefore they are not easily hurt.

The Differences, 1. In respect of the Original.

2. By reason of the Magnitude.

3. In respect of Time.

The Prognostick.

is hardly or not at all to be cured. What is excited upon some occasion, or from a solitary evident cause, or succeeds a Feavour, also upon which comes a Manginess, Whelks, the Hemorrhoids, or spots in the skin, is easily cured.

Those who are obnoxious to this Disease at intervals, about *Midsummer*, or when the Dog Star arises, are in greatest danger; also those who are altered according to the changes of the Air, or when long cold and foul weather are opposite in the constitution of the Heaven.

As there are two kinds of Madness, to wit, Continual, and Intermitting; so the means of healing ought to be twofold.

1. The Curatory method to be administer'd, as to continual Madness, suggests the commonly noted three primary Indications, viz. The first Curatory, which respecting the Disease it self, endeavours to correct or allay the furies and exorbitances of the Animal Spirits. Secondly, *Preservatory*, which being levelled against the causes of the Disease, endeavours to take away or amend the sharp and Nitro-sulphureous Dyscrasies of the nervous Juice and the Blood, as also the Stygian disposition of the Spirits. Thirdly, *Vital*, which directs such a means of dyet and restraint, which is only fit in this Disease, for the nutritive and vital function to have and be sustained with.

The first Indication, viz. Curatory, requires threatnings, bonds, or strokes, as well as Physick. For the Mad-man being placed in a House convenient for the business, must be so handled both by the Physician, and also by the Servants that are prudent, that he may be in some manner kept in, either by warnings, chiding; or punishments inflicted on him, to his duty, or his behaviour, or manners. And indeed for the curing of Mad people, there is nothing more effectual or necessary than their reverence or standing in awe of such as they think their Tormentors. For by this means, the Corporeal Soul being in some measure depressed and restrained, is compell'd to remit its pride and fierceness; and so afterwards by degrees grows more mild, and returns in order: Wherefore, Furious Mad-men are sooner, and more certainly cured by punishments, and hard usage, in a strait room, than by Physick or Medicines.

But yet a course of Physick ought to be instituted besides, which may suppress or cast down the Elation of the Corporeal Soul. Wherefore in this Disease, Blood-letting, Vomits, or very strong Purges, and boldly and rashly given, are most often convenient; which indeed appears manifest, because *Empericks* only with this kind of Physick, together with a more severe government and discipline do not seldom most happily cure Mad folks. But indeed, this more sharp handling is not convenient for all Mad people, but to the most furious. Others more remissly Mad, are healed often with Flatteries, and with more gentle Physick.

In most Mad folks the taking away of Blood copiously ought to be in the beginning of the Disease, as it is the common practice and vogue of the people. And indeed, while there is strength, the opening a vein ought to be repeated, sometimes in the Arm, sometimes in the Neck Vein, Forehead, or Foot; and sometimes it is expedient for the Hemorrhoidal Vessels to be opened by Leeches; for these evacuations being timely made, both the raging of the Spirits and the lifting up of the Soul, are best of all suppressed; then besides the Dyscrasies or evil habits of the Blood (for that what was sharp and Corrosive in it being drawn forth, a new and gentler comes in its place) are amended.

That Vomiting Medicines are highly profitable for the curing of Mad people, it is almost a Proverb, so that the most part of *Hellebore*, yea almost all *Anticyra* is allotted to them. By what means Emeticks do often help in Cephalick Diseases, we have shown already. *Quack-salvers* in this case, give with success many times, though rashly and with danger, a large Dose of *Stribium*. But Chymical things are here more convenient, both because they move more strongly, and because also the sick may be more easily deceived by them.

Take of the Sulphur of Antimony eight grains to ten, of the Cream of Tartar half a scruple; mix them together by pounding them, make a Powder: let it be given in a spoonful of *grewel*; or if it be to be given deceitfully, to one not knowing of it, let it be put into a bit of white Bread, and so let it be taken in Milk or Broth. Let this Vomiting Medicine be often repeated, to wit, once in four days.

Take six or seven grains of *Mercurius Vita*; let a Powder be made, and given after the same manner. The Emetick Tartar of *Mynsicht*, and of *Hercules Bovinus*, and other various preparations of Mercury may be given after the same manner. *Aurum vita* or the Solar Precipitate, also the Lunar Precipitate, are esteemed by Chymists for specifick Remedies against madness; and indeed, Mercurial Medicines, for that they operate not only by Vomit and Stool, but oftentimes by Sweat, Urine, or Salivation, do notably help. A long and plentiful spitting or flux at the mouth hath perfectly cured some Mad people.

3. The more ſtrong Purging Medicines, (where ſtrength and the conſtitution may bear them) becauſe they depreſs the raging of the Spirits, and of the Blood, and very much evacuate the *Emunctories*, that are for the receiving the recrements of the Blood, and nervous Juice, do often bring help in this Diſeaſe. For this uſe preparations of black *Hellebore*, as chiefly its extract, and Wine of the Infuſion of its ſtrings, or the pulp of an Apple with the roots of it boiled together are much praiſed.

Take of the Extract of black *Hellebore*, of *Calamelanos* of each one ſcruple: make a Bolus.

Take *Calamelanos* one ſcruple, of *Diagridium* from twelve to fifteen grains; make a Powder.

Take of *Confectio Hameck*, or of the Electuary of the juice of *Ros* half an ounce to ſix drams: let it be given in broth.

Take of the Decoction of *Senna Gereonis*, or of *Epithimum* (with the roots of black *Hellebore* two drams) ſix ounces; make a draught.

Take of the Powder of *Diaſenna* two drams: let it be taken in Poſſet-drink.

In the mean time, whiſt theſe things are doing, let the Preſervatory Indication reſpect the cauſe of this Diſeaſe. Wherefore, with theſe frequent purgings and letting of Blood, between whiles let altering Medicines or Remedies be uſed, which may temper the Blood and nervous juice, and reduce them to their due temper; if that the ſick be tractable and orderly enough, they will not reſuſe to take ſuch things methodically.

The preſervatory
Indication.
Altering Medi-
cines.

Take of *Crystal Mineral*, or of the beſt purified *Nitre* two ounces, of *Pearls* powdered two drams, of *Sugar Candy* two drams and a half, of *Camphor* half a ſcruple; let them be all beaten together to a moiſt fine Powder: let two drams of this be put into a glaſs veſſel that will hold two quarts of Spring-water; or of clear ſmall Ale, or Beer and mild; let it be given for ordinary drink at pleaſure.

Put to *Whey* being made hot the flowers of *Violets* or *Water-Lilies*, and after they have infuſed for two hours, let them drink it plentifully; alſo the *Spaw Waters* are convenient for Mad people to drink orderly, and plentifully.

Take of the tops of green and the tendereſt *Borrage*, and *Bugloſs*, each four handfuls; three Apples pared, of *Sal Prunella* two drams, of *Sugar* half an ounce; let them be bruised together, and pour to them of Spring-water three pints; make a ſtrong Expression: take half a pint thrice in a day or oftner.

An Expression.

Take of the Conſerves of *Borrage* flowers, and of *Violets*, each three drams; *Confectio de Hyacintha*, of *Alchermis*, each two drams; of *Coral* prepared a dram and an half, of the Powder of *Pearls* one dram, of the Salt of *Coral* one dram, of the Syrup of red *Poppies* what will ſuffice; make an Electuary, of which take two drams twice or thrice in a day, drinking after it of the following liquor four ounces.

An Electuary.

Take of the waters of the flowers of the *Water-Lilie*, *Borrage*, *Bugloſs*, and of black *Cherries*, each four ounces; of red *Poppies* ſix ounces, of red *Rose-water* two ounces, of *Camphor* tyed in a rag and hang'd in the glaſs half a dram, of the Syrup of *Coral* one ounce and a half; mix them and make a Julep.

A Julep.

Take of the yellow flowers of the *Willow-tree* what will ſuffice, let them be diſtilled in a common Still, and let the Diſtillation be repeated, by putting to it freſh flowers for three times: Give of it four ounces twice or thrice in a day, ſweetning it with the Syrup of *Water-Lilies*.

A Diſtilled Water.

Take of the leaves of the *Willow*, *Meadowsweet*, *Pimpernel*, *Borrage*, *Balm*, each ſix handfuls; of the flowers of the *Water-Lilie*, of the tops of *St. Johns-wort*, each four handfuls; of *Camphor* powdered three drams, all being bruised together, pour to them eight pints of new Milk; let them be diſtilled in common Stills.

Let the brains of *Weathers* be diſtilled with Milk, and give of the water three or four ounces thrice in a day.

Further there are to be uſed Specifick Remedies, ſo called, of which is famous, a Decoction of *Pimpernel* with the purple flower, alſo the tops of *Hypericon* or *St. Johns-wort*, and other Decoctions, Opiates, and Powders of *Antilyſſi* are frequently noted among all the famous *Empericks*.

Specificks.

Concerning the cure of *Madneſs*, excited from the biting of venomous or mad Animals, for that it is almoſt only *Empirical*, and commonly known, we ſhall not diſcourſe of it in this place, and ſince we have elſewhere propoſed our conjectures concerning it. But a Decoction or an Infuſion of Apples, either raw or boil'd in Spring-water, the liquor

A Decoction and Infuſion of Apples.

quor of *Tea*, Emulsions, with many other things, whose forms we have shewn in the Cure of *Melancholy*, are convenient in this case.

Other Chirurgical Remedies.

Moreover, from Chirurgical Remedies, besides opening of a Vein; many other helps are wont to be had for the curing of this Disease. *Cupping-glasses* with Scarification, often help. *Blisterings*, *Cauteries* both actual and potential are praised of many. Others commend cutting an *Artery*, others *Trepaning*, or opening the Skull, others *Salivation*. But these kind of administrations, besides that their effects are uncertain, can hardly be performed, or not at all safely, by reason of the intractability of the sick; wherefore, it were here superfluous to inquire into the reasons of help or cure to be expected from them. The hair being shaven off, sometimes it is expedient to apply to the forepart of the Head the hot Lungs of a Lamb or Weather, and other Fomentations, and so to change them. But these sorts of Remedies also are hardly to be applied and repeated methodically, because of the reluctancy of the sick, and so often afford more hurt than help.

3. The vital Indication.

3. The vital Indication institutes how mad people ought to be handled, concerning their government, dyet, and sleep. In this Disease there is no need of keeping up the flesh, as in most other Diseases: For the spirits ought not to be refreshed with Cordials, nor strength to be restored with Medicines; but on the contrary, both being too raging of themselves, things are to be administer'd as it were for the suppression or extinction of a flame raging above measure. Therefore let the diet be slender and not delicate, their cloathing coarse, their beds hard, and their handling severe and rigid. But sleep, for that it is very necessary, ought to be caused sometimes by *Anodynes*; for which end, *Hypnotick* Remedies or Medicines above prescribed for *Melancholy*, are also convenient in this Disease. In inveterate and habitual Madnefs, the sick seldom submit to any Medical Cure; but such being placed in *Bedlam*, or an Hospital for Mad people, by the ordinary discipline of the place, either at length return to themselves, or else they are there kept from doing hurt, either to themselves or to others.

Histories and Examples of mad people are to be sought in *Bedlam*, or Hospitals for mad people.

There is no need to illustrate the nature of this Disease with Histories and Examples, or to describe the manifold Types of it; but rather let them go to the Hospitals of Mad people, where they may behold, not without a wonderful spectacle, as it were a new and monstrous nation of men, contrary to rational people, and as it were our *Antipodes*; all which, if they were gathered together in one place, and that all, Madmen and Fools were joyned to them; I know not whether this world would not be equally divided between them and the sober and prudent.

The Cure of Intermitting Madnefs.

Thus much concerning the cure of continual Madnefs. The intermitting, either has perfect lucid intervals, in which the sick return to themselves, or the fury only ceases, the *Delirium* being still left, insomuch that the distemper'd become gentle and tractable, yet still they continue amiss, as to their imagination and judgment, and speak and do many absurd or incongruous things, and afterwards sometimes again become furious.

The Curatory Indication.

The Cure of either of these Distempers, as to the Curatory Indication, is the same, as in continual Madnefs, so that there is no need to shew here any other Medicines, or method. But as to what respects the *Prophylaxis* or Preservatory Indication, by which the means of healing is instituted out of the fits, cautions and threatnings are to be given them; in whom only the Fury intermits, the *Delirium* remaining, the very same Remedies of Medicine, which we have prescribed for the taking away the foregoing cause of *Melancholy* are convenient.

Preservatory.

In Madnefs which perfectly intermits, as to all its Symptoms, at the chiefest convenient times, to wit, Spring and Fall, they ought to enter into a solemn course of Physick; and besides, there is a continual need of looking to, or governing the sick, both as to diet and to their manner of living, that they may be always preserved in an equal and a moderate temper; and also, that as soon as the signs of the approaching fit appear, its coming may be hindred by Blood-letting, and by administering of Medicines.

Therefore, in the times of the *Aequinoxes*, let Blood be taken out of the Arm, and seven or eight days after out of the *Hemorrhoidal* Veins by Leeches. Let Purges and Vomits be given twice or thrice at due intervals. Moreover, between whiles, let them take in order altering Remedies, at Physical hours. The Formulas or Recipes of these are set down both in this Chapter and in the former for the cure of *Melancholy*. Let the dyet be slender and of good digestion; as concerning exercise or motion, sleep, and other *non-naturals*, let them be all moderate. When the approach of Madnefs is seen to be at hand, and constantly before the Summer Solstice, let *Phlebotomy* be celebrated, with Vomiting, and a more slender or sparing diet.

C H A P. XIII.

Of Stupidity, or Foolishness.

S *Stupidity, or Morosis, or Foolishness*, although it most chiefly belongs to the Rational Soul; and signifies a defect of the Intellect and Judgment, yet it is not improperly reckoned among the Diseases of the Head or Brain; forasmuch as this *Eclipse* of the superior soul, proceeds from the Imagination and the Memory being hurt, and the failing of these depends upon the faults of the Animal Spirits, and the Brain it self.

We have before clearly shewed; that the Rational Soul doth subsist in a sensitive or corporeal Soul, and that its principal seat is the Imagination: Further from this, and the Memory, either the notions themselves, or their occasions of all things are supplied, which the Mind beholds; wherefore, when it happens that these Corporeal Functions are defective or hindred, forthwith the eye of the Intellect, as if covered with a veil, is wont to be very much dulled, or wholly darkned. Therefore, that the reason of *Foolishness* and *Stupidity* may be rightly delivered, first we ought to inquire by what means, and from what causes, the Imagination and the Memory are often defective or fore-hindred.

Stupidity arises chiefly from the failing of the Imagination and Memory.

That we may proceed methodically, concerning these, hither ought to be referred, what we have discoursed before concerning the Functions of the Corporeal Soul, and their subjects and instruments. we have at large declared that the *Callous Bodies*, or the middle of the Brain is the seat of the Imagination; and the Cortical Marrows of the Brain, the seat of the Memory; and further, that the Animal Spirits are the immediate organs of either. Wherefore, because their powers being hindred (which are the first or chief movers of any other Function, both rational and sensitive) the Imbecillity and dulness of the mind, the slowness of the ingenuity, stupidity and madness at length do often arise; the fault is either in the Brain it self, or the Animal Spirits, or both together; and at first now these, now that.

Wherefore the Organs of these Faculties labour in this Distaste.

1. As to the Animal Spirits, we have largely enough declared, of what sort they ought to be, of their proper and genuine nature, and what they are by reason of their preternatural disposition, in the *Phrensie*, *Melancholy*, and *Madness*. But besides (which we before mentioned) it may be suspected, that these Spirits being sometimes almost destitute of active Particles, become as it were liveless or vapid; to wit, when the spirituous Particles ought to excel, and to get to themselves volatile Salts; in *Stupidity*, both these, together with the Sulphureous, being too much depressed, they are almost drowned and overwhelmed with the watery and terrestrial. For indeed, Fools are not so dull or of such thick understanding, as their soul seems to be indued with, and their Animal Spirits are rather formed of clay than their Heart. There are many occasions or evident causes, by which the Animal Spirits acquire so deadish a texture, the chief of which we shall touch on by and by.

2. But it doth not frequently come to pass, that *Stupidity* is excited by the mere solitary fault of the Spirits, or of the Corporeal Soul it self, but more or rather the Brain it self is found to be first in fault: For as there are many things requisite, by which this exact subject or machine of the Animal Function is constituted, if by chance any thing of them be deficient or depraved, it easily follows, that such so distemper'd have little wit.

First, It is a vulgar observation, That the wit and ingenuity doth depend somewhat on the magnitude and figure of the Head, and consequently of its Brain; for as to its bulk, it is a Proverb, that it argues little of Brain or too much Foolishness. And although this does not always happen, yet it does for the most part. The reason of which is, because in a little Brain but a few Spirits are begotten and exercised; but in a greater, consisting for the most part of a vile or base texture or frame, it is less fitted for the quickness or sharpness of the mind.

1. As to Magnitude.

Secondly, The genuine and best figure of the Brain ought to be globous; to wit, for the end that the Spirits may be poured forth with an equal efflux on every side, from its middle part to the whole compass, and may be from thence retorted every where by equal angles of reflections. But those who have a flat head, or too sharp, or otherwise impropportionate, are affected for the most part with some noted fault of the Animal Function; for these kind of Brains, like distorted Looking-Glasses, do not

2. By Reason of the Figure.

rightly collect the Images of things, nor truly object them to the Rational Soul.

3. As to its Substance or Texture.

Thirdly, The substance of the Brain should be well temper'd; and of a laudable frame; not only as to the qualities of heat and cold, of dryness and moisture, but its *Systasis* or Constitution consisting of plenty of a volatile Salt and Spirit, with a moderate proportion of the rest should be thin and airy, that the Spirits may pass thorow the whole, and cut out to themselves paths; also it should be moderately firm and compacted, that the tracts and passages being made, may remain, and not be presently blotted out again, by the sinking of the too soft parts. But in *Stupidity*, it is to be suspected, that there is in the Brain an excess of some manifest quality, as of moisture or coldness, for which reason Children and old people are wont to be affected with a dulness of their senses; or sometimes, the Texture is too thick, and Earthy; so that the spirits do not easily irradiate it, or cut tracts for themselves; to wit, they cannot penetrate an opacous or thick body, no more than rays of light. To this kind of dreadful Texture of the Brain, those that are born of Plowmen and Rusticks, as if they were formed of a worser clay, are obnoxious; hence in some Families, reckoning many descents backward, there is scarce one witty or wise man found. In some places, the influences of the Heaven and Air incline, as it is thought, the Inhabitants to *Stupidity*; so, to be born in *Batavia*, is proverbially, as much as to say, a Fool.

4. The evil conformation of the Brain, as to its pores and passages.

Fourthly, Besides these vices of the Brain, which are for the most part original and born with it, sometimes its evil conformation, as to its Pores and Passages, by reason of some acquired inordinations, is a cause that the Animal Function is not rightly performed. For first of all, as to what appertains to the smaller Passages and Pores of the Brain (which the spirits themselves frame every where thorow its whole substance, and perpetual flow into them for the exercise of the Animal Functions) it sometimes happens that these are either defective or perverted, and so bring on a dulness of mind, or *Foolishness*. These little spaces are defective, because the consistency of the Brain being either too obdurate or too fluid, it will not indure to be cut thorow after a due manner, or to remain or continue so bored thorow. But we suspect those Passages to be perverted, either because they are too loose or too strait, or else, for that their making is unequal. Too strait Pores do not sufficiently admit store of matter for a good plenty of Spirits: Those loose above measure, receive together with that matter, *Heterogeneous* Particles, and infecting the Animal Regiment. They seem to be unequally formed, where they are more open in one part of the Brain, and more strait in another. For this cause we think it to be, that some understand, or know things well enough, but still judge evilly; for that their notions and conceptions, like the visible Images, passing thorow a diverse Medium, become distorted. Further, perhaps for this reason it comes to pass, that some excel, or are strong in Imagination and Phantasie, yet are very deficient in Memory, and others on the contrary.

3. Stupidity sometimes proceeds from both of them being in fault together.

3. It sometimes happens, that both these conjunct causes do concur together to *Foolishness*, to wit, because both the Animal Spirits are dull and torpid, and also the Brain evilly conformed. And in truth, which part soever is first in fault, it quickly will make the other in like manner guilty. Because when the Spirits being blunt and sluggish do not freely pass thorow the Brain, the Pores and Passages in it are not either sufficiently cut thorow, or else they close again; and the Spirits if they cannot expand themselves, by reason of the evil texture of the Brain as they should do, they at length becoming slothful and idle, grow heavy, and acquire a vicious disposition.

What the Antecedent Causes of Evident Foolishness, are,

Thus much concerning the Conjunct Causes of *Foolishness*, as to its *Procatartick* and *Evident*, there belong more occasions, by reason of which the aforesaid evils are wont to be brought to the Brain, or the Spirits, or to both together.

1. An Hereditary Disposition.

For in the first place, *Stupidity* (as we but now observed) is sometimes original or born with one, and so it is either *hereditary*, as when Fools beget Fools, the reason of which is clear enough, to wit, the same weak Particles flowing for the constituting the Animal Organs in the Son, which were in the Father: or *Stupidity* being born with one, is as it were accidental, to wit, it frequently happens, that wife men and highly ingenious, do beget Fools and Changelings, or heavy witted: which we suppose so to come to pass sometimes for this cause, for that the Parents being too much given to study, reading, and meditation, the Animal Spirits that inhabit the Brain, are so much wallied, that for the supply of them, the most generous Particles of the Blood are still carried to the Head, and but few only, and small, are permitted to descend to the *Spermatick* Bodies. When the rational Soul becomes greatly solicitous in bringing forth its child (which are the works of the Intellect) then the Corporeal Soul (the Spirits being called away to wait on the other) becomes not at all, or very weakly prolific.

Why strong or wife men are not always begotten of strong and wife men.

The first Reason.

A Second Reason.

Besides this reason, there is another frequently to be met with, wherefore the first implanted sagacity of men, as well as of *Brutes*, is not often propagated from the Parents

Parents to the Children. For when as we presume certainly, the Colt of a generous Horse, or of a delicate strain, or the Chickens of a Game-Cock, that they will *patris- fare*, or be like their Sires, so that they are sold at a great rate, and the virtues of these, if not broken by inordinate and preternatural feeding or bringing up, descend by a long series to their young from age to age: This often happens otherwise to men, to wit, because the Parents do so enervate and weaken their bodies by intemperance, luxury, and evil manners, that they beget only languishing and unhealthy Children. Hence it is, that for the most part, those who are born of Parents broken with old age, or of such as are not yet ripe or too young, or of drunkards, soft, and effeminate men, want a great and liberal ingenuity or wit. Nor does there happen a less detriment to them of the Animal Faculty, whose sires are obnoxious to evil affections of the Brain, as the *Palsie*, *Epilepsie*, *Curus*, *Convulsions*, and the like; so that to be born of Parents who have a sound mind in a sound body, is far beyond a large patrimony.

Secondly, There are more evident causes, by which *Stupidity* is wont to be induced, to some originally whole. Some at first crafty and ingenious, become by degrees dull, and at length foolish, by the mere declining of age, without any great errors in living; to wit, because the nervous liquor, and the blood, (whose evil dispositions the Animal Spirits partake of) like some Wines, and other fermented liquors, depart from their vigor after a perfect Fermentation; and by little and little degenerate into a dead and pallid substance. For it is observed, the wits of some people do receive a various increase and decrease, according to the periods of their Ages. I have known many in their childhood very sagacious, and extremely docil or apt to learn, that by their literature and discourse have caused admiration, who afterwards becoming young men, were dull and heavy: and those who at first were very beautiful, were afterwards not at all handsome, or beautiful in their aspect. In like manner, it often happens on the contrary, that many at first indocil or unapt to learn, and wholly unfit for literature, and seeming of an ill favour'd countenance, when they have become young men, or have put off their childhood, have had both an excellent wit, and become beautiful. The reason of the former is, that some ripe wit, or ingenuity, like garden fruit, does not remain long in the same condition, but soon declining, quickly withers. For in every mixture or concretion rightly made, there is required, that a progression from crudity to maturity be made gently and by little and little, that is, the active elements do not at first arise above the rest, and shew themselves above measure, but being involved with the others, rise up and put forth themselves by little and little; for otherwise, being too free in the beginning, and made loose, they easily fly away, leaving their subject almost dead or taste less. Wherefore, Boys who are seen to be dull in their first Age, may be hoped afterwards, when the temper of the Brain (the superfluous moisture being evaporated) is come to maturity, to become ingenious enough.

Thirdly, Sometimes great strokes or bruising of the Head, especially such as happen from a fall from some high place, do bring hurt or debility to the Animal faculties. I have known some very learned, and men of great wit and judgment, who outliving some of these falls by chance, afterwards were of a heavy and dull ingenuity. It is commonly said of such so distemper'd, that their Brain is turned; and indeed a vehement Convulsion or shaking of the Brain, greatly perverts, and not seldom presses together, or shuts up the accustomed tracts and paths of the Spirits, so that they perform the acts of the Memory and the Imagination for ever after, hardly, and amiss; so as some by some great wound inflicted on the Head, have become sottish, and afterwards mad.

Fourthly, Frequent Drunkenness and Surfeiting, especially if they sleep in their Cups, and lie as it were buried in Wine and Sleep, do very much decay the wits of some, and make infirm the use of their Reason; to wit, because by them, *Heterogeneous* little Bodies, and infesting very much the Animal Regiment, are introduced. Almost for the same reason, the frequent use of *Opiates* very much troubles the sharpness of the mind.

Fifthly, Violent and sudden passions, as in the first place, an unexpected and very great affright, or terror or vehement sadness, have caused Sottishness or Foolishness in some, so that they have been scarce able to express the sense of their mind in words, or to perform the familiar actions of life. Which certainly comes to pass, soasmuch as the spirits inhabiting the Brain upon such an occasion, are very much dissipated and drawn asunder one from another, and afterwards, are not able to repeat the the former footsteps of their motions; in like manner as Souldiers, being put to flight by a sudden and violent attack of the enemy, recover not easily their orders and stations.

Sixthly, It is observed, that some men have contracted also *Foolishness*, by reason of cruel Diseases of the Head. This frequently happens in a great and long *Epilepsie*, for that this Distemper, possessing the middle part of the Brain, perverts, and so fills and

2. Ripeness and the Declination of Age dispose some to Foolishness.

3. Great hurts of the Head sometimes cause Doting, or want of Ingenuity.

4. Frequent Drunkenness.

5. Vehement Affections.

6. The more grievous Diseases of the Head, oftentimes excite Foolishness.

stuffs up with feculencies, all the Pores and passages; the Spirits being thereby frequently and vehemently thrust forth, that the tracts of the Spirits being shut up; the acts of the internal Senses and Motions are hindred. I knew a young maid, at first of an acute wit, and lively ingenuity, who after she had long laboured with the Falling-sickness, became sottish and foolish, like a changeling. Further, I have taken notice in many, that *Stupidity* hath accompanied the *Palsie*, or has gone before it (as we mentioned in the Chapter of the *Palsie*) to wit, the same matter which brings a resolution or loosning, being in the Streaked Body, being heaped up in the *Callosus*, causes often, if not an *Appoplexy*, or *Carus*, a *Foolishness*.

The Differences
of this Disease.

Many differences of this Disease are to be met with; and first, there is commonly wont to be a distinction between *Stupidity* and *Foolishness*, for those affected with this latter, apprehend simple things well enough, dextrously and swiftly, and retain them firm in their memory, but by reason of a defect of judgment, they compose or divide their notions evilly, and very badly infer one thing from another; moreover, by their folly, and acting sinistrously and ridiculously, they move laughter in the by standers. On the contrary, those who are *Stupid*, by reason of the defect of the Imagination and Memory, as well as of the Judgment, do neither apprehend well, or quickly, nor argue well; besides they behave themselves not as the others by toying and gesticulation, but sottishly, foolishly, or like a dull Ass; so that the simplicity of these is the more miserable, who shew so the Disease in their countenance and behaviour. In *Foolishness*, it seems, that the Animal Spirits being somewhat active, though less firm, do pass thorow only more short and oblique tracts; and do not beam thorow the Brain, with an equal and constant irradiation, but leaping forth, or running out desultorily or after a leaping manner, sometimes here sometimes there perform the acts of the Animal Functions, perfunctorily only, or ridiculously. But in *Stupidity*, the Spirits being obtuse and dull of their own proper nature, and flowing, very little pervious in the more thick Brain, cannot exercise themselves rightly, for the performing the offices of the Animal Regiment.

How Foolishness
and Stupidity
differ.

Degrees of
Stupidity.

Stupidity (whose *Pathology* we here chiefly deliver) hath many degrees; for some are accounted unfit or incapable, as to all things, and others as to some things only. Some being wholly fools in the learning of letters, or the liberal Sciences, are yet able enough for *Mechanical Arts*. Others of either of these incapable, yet easily comprehend *Agriculture*, or Husbandry and Country business. Others unfit almost for all affairs, are only able to learn what belongs to eating or the common means of living: Others merely *Dolls* or drivling Fools, scarce understand any thing at all, or do any thing knowingly.

The Prognostick
of the Disease.

As to what belongs to the *Prognostick*, *Stupidity* being contracted from the birth or hereditary, or happening from unknown causes, if it still persists to ripe age, it is almost never healed: but when it happens that Children being at first dull and almost insensible, by reason of the complexions of both their Brain and Spirits being ripened, they are made ingenious and docil enough.

Evil if from
an hurt of the
Head.

In This Disease excited from an evident solitary cause, as from an hurt of the Head, or a violent passion, also coming upon an inveterate *Epilepsie*, if it continues for some time, it is afterwards incurable.

What is excited
from a Lethargy
admits a Cure.

What succeeds a *Lethargy*, and any other sleepy Diseases, depends chiefly on the hurt of this Memory, and sometimes vanishes of its own accord, those Distempers being cured. Therefore, when in these cases the cure of *Stupidity* is instituted, here are convenient almost the same method of healing and Remedies, which we have prescribed in the Preservatory *Indication* of the *Lethargy*; the chief intentions of which are, that the Animal Spirits being freed from any torpor or benumbedness, cut forth or frame Pores and passages within the translucent Brain, and may be expanded truly in them.

Sometimes it is
cured by a Fea-
vour.

Sometimes a *Feavour* has cured some Fools, and stupid, and render'd them more acute. *Huartus* tells of a certain man that was a Fool in the Court of *Corduba*, that being distemper'd with a malignant *Feavour*, came so much to himself in the midst of the Disease, and with that judgment and discretion, that the whole Court stood in admiration; and so remained his whole life afterwards, one of the most prudent men of his time. We our selves have known a certain man of a very blunt, *Baorick* or dull wit, who talking idly in a *Feavour*, most suddenly brought forth most acute speeches, and seasoned with a great deal of salt or ingenious wit. Further, we before spoke of a generous old Gentleman, who having lost his memory, and so the use of discourse, received great help by the distemper of a *Feavour* happening afterwards; the reason of which seems to be, because the feavourish burning sometimes rarefies and dispels the darkness covering the Brain.

As to what respects the cure of this Disease, *Stupidity*, whether innate or acquired (if it be not plainly *Madness* or *Seolidity*, uncapable of all learning) though it may not be cured, yet is often wont to be amended. Wherefore it must be the work both of a *Physician* and a *Teacher*, that the wit of such that are so affected, may be somewhat trimmed, and they being at least brought to the use of reason in a little measure, may be accounted out of the number of *Brutes*.

The Cure requires both a Master and a Physician.

For this end, because dull or senseless *Beetles*, or the more dull *Loggerheads* or *Blockheads*, do not readily learn the common notions of things, no more than Children the first elements of letters, therefore they are to be instituted in all things, by the frequent care of a Master, and the same things are again and again to be inculcated to them. For by this means, the *Spirits*, though slow and torpid, are a little sharpened by perpetual exercise, and they being continually excited in the Brain, how rude and crasse soever they be, do cut forth at length for their expansion, some tracts or passages, though more imperfect. But that this may the more happily and easily succeed, medical Remedies ought to be administred, which may purifie and volatize the Blood and nervous Liquor, together with the Animal Spirits; and also, that may clarify the Brain, and render it as it were *Diaphanous*.

What the Labour of the former ought to be.

What the Medical intentions are.

For the purifying the Blood, let there be sometimes administred a gentle *Purge*, and *Plebotomy* in a small quantity, if there be strength, several times; for that end also Issues are convenient, in the Arm or Leg, or both, for the driving the filthiness from the Brain: In fat folks, and such as are indowed with a moist Head, let them sometimes be made between the shoulders. Further, some in this case cry up with wonderful praises a *Trepanning*, by which the Brain may more freely breath forth, and evaporate. Let their diet be light and attenuating; their dwelling in a free air, and dry; their sleep moderate.

What kind of Remedies are shown.

1. Evacuating Remedies.

After these have for some time been administred, in the ordinary and usual manner, if that in the left part of the breast there is no beating of the heart in the *Arcadian youth*, or if there be no sign of hopes, it will be in vain to spend labour and pains, and Medicines any further on them: but if by the use of these, any signs of help, or any hopes appear, sometimes it will be to the purpose to add to these, altering Remedies, to be daily taken at medical hours, for a long time. The *Recipes* or *Formula's* of these are already delivered in our *Pharmaceutice* for the taking away the foregoing causes of most *Cephalick* Diseases; and thence may be taken: moreover what do besides respect this particular case, we think here good to add, being some magisterial Receipts.

2. Altering Medicines.

Take of the *Spirits* of *Armoniacum*, succinated, or with *Amber* six drams; let it be given from fifteen to twenty drops Evening and Morning, in three spoonfuls of the following distilled water; drinking after it seven spoonfuls of the same.

Spirits.

Take of the fresh leaves of *Nistetes* of the Apple tree six handfuls; of the lesser *Sage*, *Rosemary*, *Savory*, the greater *Rocket*, *Mother of Thyme*, *Calaminths*, *Penroyal*, *Marjoram*, *tr.* each four handfuls; of the roots of *Angelica*, of *Imperatoria*, each six ounces; of *Zedoary*, the lesser *Galingal*, of the *Aromatick Reed*, of *Winterans Bark*, each two ounces; of *Cloves*, *Nutmegs*, *Mace*, *Cinnamon*, *Ginger*, each one ounce; of *Cubeb*, *Cardamums*, *Grains of Paradise*, each six drams; all of these being cut and bruised small together, pour to them twelve pints of the best *Canary*; let them be digested cold, and close shut in a vessel for three days, then distilled according to art: let the whole liquor be mixed together, and sweetned with *Sugar* when it is taken: The Dose is two or three ounces.

A Distilled Water.

After the use of the *Spirits* of *Armoniac* for fifteen or twenty days, other Medicines about that time may have their turns, such as *Spirits* of *Harts-horn*, of *Sul.* *Humane Skull*; *Tinctures* of *Coral*, *Antimony*, *Castor*, *Amber*; the *Elixir Vita Quercitani*, *Elixir Preppariatis*, *Spirits* of *Lavender*, &c.

Tinctures, &c. Lixirs.

Or Take of the *Conserves* of the flowers of the *Lilie* of the valley six ounces, of the roots of *Acori veri* preserved six drams, of *Ginger* preserved in India, of preserved *Nutmeg*, each half an ounce; of *Species Diambra* two drams, of *Lignum Aloes*, yellow *Saunders*, the pickt roots of *Zedoary*, of *Cubeb*, of *Jamaica Pepper*, each one dram and a half; of *Coral* prepared two drams, of the *Syrup* of *Candied Ginger* what will suffice; make an *Electuary*. The Dose two drams Morning and Evening, drinking after it of the distilled Water three ounces.

An Electuary.

For those whose Brain is too abounding with moisture, let them drink every Morning a draught of *Coffee*, with *Sage* leaves boiled in it: For those who have their Animal *Spirits* too poor and liveless; let them take *Chocolate*, as we have described it above, which

Coffea.

Chocolate.

which seems most profitable. For ordinary drink let small Ale or Beer be prepared in a vessel containing three or four Gallons, and after it has work'd, put into it in a little bag, these following things. Take of the leaves of Sage, the sharp leaved and dried, four-handfuls; of Cubebs one ounce, of Cloves and of Nutmegs bruised, &c. Mix them according to art.

Physical Brew.

Outward Applications have also a place here; such are a quilted Cap, Plasters, and Liniments: and sometimes let these, sometimes those or others be administer'd.

A Cap or quilted thing for the Head.

Take of the flowers of the Lily of the valley, Rosemary flowers, Stachadoes, each one handful; of Celtick Spike two drams, of the roots of Cypress, the lesser Galingal, the Florentine Iris, each three drams; of Labdanum, Benzoin, of Toluian Balsam, of Amber, each two drams; of Nutmegs, Cloves, Mace, Cinamon, each one dram and a half: make of them all a fine powder, quilting it in a Cap with silk between.

A Plaster.

Take of the Plaster of Floris unguent, so called, two ounces, of Tachamabac, of Carragee, of the Balsom of Tolu, each three drams; of the Powder of Amber, Myrrh, each two drams; of Cloves, Nutmeg, Mace, each one dram; being all liquefied or melted together, let them be made into a mass, of which make a Plaster, spread it on leather, and the head being shaved, put it to it.

A Liniment.

Take of the Oyl of Palms half an ounce, of Capive Balsom three drams, of the Balsom of Peru one dram, of the Oyl of Nutmeg, by expression two drams, Oyl of Amber half a dram; make an Ointment for the Head.

I might here add many other Medicines, and ways of Administrations, but in this almost desperate case, where oftentimes no Remedies are wont to help, and the Cure never perfected, these may suffice.

CHAP. XIV.

Of the Gout.

The Distempers of the Gout and Colick are Distempers of the nervous Stock.

AMong the Diseases of the Head and the nervous stock, we may refer hither some Distempers that are chiefly wont to infest the Feet and the Belly, to wit, the Gout and the Colick. That the seat of either is in the nervous parts, we may very well conclude from the primary Symptom, to wit, pain. The cause of this latter, Charles Piso has affirmed to exist within the Head, and Fernelius affirms the same of the other. Wherefore we shall endeavour to deliver the Pathologie of either, together with the apposite means of healing them; and first we shall speak of the Gout.

The Subject of the Gout.

The name of the Gout denotes plainly its subject; because that it is almost only Articulate, or is in the space where the heads of two or more Bones meet together. This Disease is wont to be excited more frequently about the Internodia or knittings of the Bones of the Feet; because this part being greatly declining, and remote from the Praecordia, and the fountain of Heat, receives readily the Morbifick matter, and does not easily overcome it, or quickly put it off. Yet the Gout often happens in the jointings of the Hip or huckle-bone, the knee, the bending of the arm, the shoulder, the wrist, the ancle, and of other parts.

Its appearances rehearsed.

The fits of this Disease (which are almost ever intermitting) invade either wandringly, or periodically; which being finished, sometimes sooner, sometime more slowly, the intervals happen lucid or quiet enough; presently after the first assault of it, for the most part pains arise without any tumor; though afterwards, about the height of the Disease, the distemper'd part often swells up; the pains in the beginning yield to no Remedies, but are made more cruel by Catharticks, and are not presently put to flight by Topicks, or wont to be allayed. The Fit most often falls upon one without any previous distemper, but suddenly; yet sometimes there will be an heat of the blood, or a little feavourish distemper going before. The disposition to this Disease is sometimes hereditary, and sometimes acquired, by reason of an evil manner of living. The occasions or causes, which being wont to move this disposition, stir up the Gouty pains, are all violent alterations or passions, inflicted on the humors or spirits. Hence Surfeiting immoderate drinking, especially of sharp and thin Wines, transpiration being hindered, wrath or indignation, immoderate Venus or Lust, sadness, also the changes of the air, and of the year, and any great mutations ordinarily induce fits of this Disease. Those obnoxious

to this disease, are sometimes in danger to be distemper'd also with the *Stone*, or *Gravel* in the *Reins*; and so on the contrary, those obnoxious to the *Stone*, are wont to be troubled with the *Gout*. Yea, the *Gout* growing grievous, it every where heaps up about its nests, to wit, in the *joynts*, a *calculous* or *stony* matter, and there excites a *stony* or *hard* bulk.

The distemper'd parts, whose pains are stirred up in the haul'd *Fibres*, for the most part are the *Periostea*, or the heads clothing the *Membrane* of the *Bones*, and perhaps the *Tendons* and *Ligaments* there planted about. But sometimes the pain in these parts, wholly depends upon a breach of the unity, and this proceeds from a certain matter being impacted in those *Bodies*, or lying upon them; first of all we shall inquire, what sort of morbid matter this is; secondly, from whence it comes; and thirdly, by what means it so stirs up periodical *Gouty* Fits, by breaking the unity in them.

As to the *Morbific* Matter it seems, first that it is not the *Blood* or nervous juice of it self; nor is it one only simple humor laid up a part from the others. We deservedly excuse the *Blood* from this censure, because these pains only infest *Bodies* for the most part without *Blood*; yea, and almost them only. For although in the neighbouring parts, by reason of the course of the *Blood* being hindred, sometimes a tumor happens with an inflammation; yet this is not the Disease, but a *Symptom*, and for the most part comes upon the *Gout*. Further it appears, that the nervous juice (how ever sharp, or biting, or pricking, or pulling it is supposed to be) does not excite of it self the pains of the *Gout*; because then the Distemper would cause pains also, or as much in some other passages of the nervous parts, and also in the *Internodia* or knittings of the *Bones*.

The parts affected.

The Morbific Matter.

It is improbable, for the same reason, that any singular excrementitious, or superfluous Humor or Matter deposited from the *Blood* or nervous juice, to cause the pains of the *Gout*. For if such were only carried thorow the *Nerves*, it would excite pains by order, and a continual tract, not first in the feet or extream joints, but by irritating the nervous Stock in its whole journey. If that according to the opinions of *Hollerius*, *Sennertius*, and other Moderas, it be affirmed, that some impurities falling off from the heated *Blood*, and received by the joints, is the material cause of the *Gouty* pain; then it should follow, that all who are greatly obnoxious to the *Gouty* Distempers, are also most prone to *Feavourish* burnings or heats; and that a *Feavourish* heat should precede every assault of this Disease; neither of which to be true, common observation doth witness. For those troubled with the *Gout*, as it were with a privilege (to wit, by reason of the *Saline* dispositions of the *Humors*) are free from a *Feavourish* Distemper. Further, the Fits of the *Gout* most often arise of a sudden, without any great swelling up or ebullition of the *Blood*, and presently at the beginning become very cruel; which also argues, that the *Morbific* Matter is not by degrees laid up in the distemper'd part, as in a *Mine*, and then to excite pains by its fulness. For if it were so, the beginnings and the increase of the Disease, being always made *gradatim*, they would be longer and more durable; nor doth the distemper (as it often is wont) being presently vehement, by and by change its seat, and quickly vanishing in one place, anon arise up in another.

It is not any simple or singular Humour suggested from any of them.

When therefore any singular humor (of which sort soever it be supposed) seems not efficacious enough, for the provision of the Fits of the *Gout*; we may affirm, That in the nest or mine of this Disease, (whether it be one or many), that many fermentative juices, and those not easily to be mixed, do meet together; then from the strife and growing hot of these, the painful Vellications or pullings of the nervous *Fibres* do arise.

In the Mine of this Disease two humours concur, and mutually grow hot.

Formerly discoursing of the wandering *Scorbutick* *Gout*, and the *Rheumatism*, we plainly shewed what was also the cause of this *Gout*, of which we now treat; viz. forasmuch as it appears by a very vulgar experiment, that salts being put in a diverse state, to wit, some of them being fixed or *Alcalizate*, and others having gotten a flux, or sharp, or acetous things, being put together, do very much boil up and grow hot, and their humidity causing a white and hardish *Coagulum* or curdling; as for instance well known, when the spirit of *Vitriol* is poured to oyl of *Tartar*, it manifestly appears; and why may we not think, that in the fits of the *Gout*, there is something like it? to wit, that from the fighting and mutual conflict of the *Liquors*, which are of a diverse *Saline* nature, the nervous *Fibers* are pricked and provoked, and at length, from the various *Coagulations* of either juice, that there is sometimes heaped together in the distemper'd places, a *Calculous* or *stony* matter.

In like manner, as when the Spirits of *Vitriol* are poured upon Oyl of *Tartar*.

That we may shew the genuine matter of the *Gout*, we ought to referr hither, what we have elsewhere said, concerning the nourishment of the solid parts. For indeed, we have shewed, that to that office both the *Blood*, and the nervous *Liquor* do bring their

A *Vitriolick* Matter partly supplied from the Nervous Liquor.

their tributes; to wit, when the nourishing juice is carried from the Blood, thorow the Arteries, to all the parts of the whole body, another liquor being deposited from the Brain, thorow the Nerves, and their dependences, doth actuate that former, as it were with an inspired spirit, so that it is made full and fertile, and so more easily insinuates into the Pores and passages of the part that is to be nourished, and is assimilated into its substance. There will be no need to repeat here what we have formerly discoursed at large; as to what respects the present matter, we shall take notice, that the nutritious humor, distributed from the blood, consists of a little Spirit, but of more plenty of Water, Earth, and Sulphur, and moderately of Salt, somewhat volatile; further, whilst the nutritious humor is distributed, for that its Particles, which are for the cherishing or nourishment of any part, ought to be proportionate, and to remain like it self; therefore, whilst the spirituous are destinated to the Brain, and the sulphureous to the flesh, the inwards and the fat, it is behovesful, that the most *Saline* and more fixed, should be laid up about the jointings of the Bones, and then growing full with the nervous liquor, to be assimilated with them.

Either Matter, growing degenerate or depraved, turns to the Gout.

1. From the Blood, for that it becomes full of a fixed Salt.

2. From the Nervous Liquor, for that it is acetous or sharp.

The former is, as it were, the feminine Seed of the Gout;

The other masculine.

The Procatartick, or foregoing Causes of the Gout:

1. A Mine of fixed Salt laid up about the Internodia, or Knitting together of the Bones.

This Matter is not merely Excrementitious,

nor a Bilous or Phlegmatick Humour.

But if by reason of the vitious *Dyscrasie* of the Blood, it happens that Particles saltish above measure, and fixed, should be laid up in the joints, and by reason of their incongruity are not presently assimilated; they soon after grow together into an heap, or a certain Morbific mine. But the Fit of the *Gout* is not wont for that reason to be excited, but an heaviness only and languishing of the distemper'd member, which is oftentimes taken away by abstinence, or exercise, or Physick; the strange Particles being dissolved, or supped back again into the Blood.

But if the Particles of the nervous liquor degenerate from a volatileness into an acetous Flux, a flowing arising from thence, they fall down in too great plenty into the little joints, and because they there grow hot, with the *Saline* or *Lixivial* Mine, there before laid up, they stir up the Fits of the *Gout*.

The *Saline* or *Tartarous* Matter therefore being laid up from the Arterous Blood, about the jointings together of the Bones, is as it were the feminine seed of this Disease; which notwithstanding, though there be heaped together a great plenty of it, it of it self wholly unfruitful, like an Egg without a Cock; until the nervous liquor growing turgent, sends its acetous Recrements falling from it, into the nest of the former; which immediately, as it were the masculine seed, renders the other prolific. For inasmuch as those two Particles which are of a different state and original, do meet together, and mutually concur, they pull or haul the Fibres of the Membranes and Tendons, and so stir up the fit of the *Gout*; the allaying of which, wholly depends upon the mutual subaction or bringing under, and the diffation or blowing away of the most sharp Particles of either kind.

These things concerning the formal reason, and the conjunct cause of the *Gout*, being thus laid down, we will proceed to the further unfolding its *Procatartick* or foregoing causes: And we say, that these are a *Saline* matter, laid up from the Blood in the joints, and acetous or sharp Recrements, sent into the same nest, from the swelling up of the nervous liquor.

First therefore, that this sort of *Saline* Mine is laid up about the jointings or knitting of the Bones together, is plainly argued by the sudden and unlook'd for assault of this Disease, and from its difficult cure; for the matter doth not flow into the distemper'd part altogether, and at once, in such abundance, that it should excite a fit so grievous and tedious, besides, for that the pains are repeated still within the accustomed nest, it seems that their fetation or hatching doth most certainly depend upon the Egg somewhere laid up before hand. But that this matter is not merely Excrementitious, but a portion of the nourishing juice, degenerate towards a fixed Salt, being destinated to the same bony parts, we may lawfully conjecture, because an humor merely Excrementitious, would cause in the distemper'd place, a continual trouble and tumor; moreover, this plainly convinces, from the cure of the *Gout*, by torture or cutting of the part: For Authors worthy to be believed, have told us in their writings, that the Member being cut off, in which the sickness uses to be, or greatly wounded, that the Disease has ceased without any relapse; in like manner as a most grievous Tooth-ack, and continual, is most often cured by pulling out the distemper'd Tooth.

If that the *Goutish* humor were (as it is commonly said) a *Cholerick*, or a *Phlegmatick* humour, or any other merely Excrementitious, it flowing afterwards to some other member, after the former distemper'd were cut off, would there excite a new Morbific Mine; but this happens only in some accustomed joints, for that this or that part is become more weak, and so admits into it self the more easily, all other filthy portions; and neither assimilating nor sending them away, suffers them to increase into a Morbific Mine. Further, the Recrements also of the nervous juice, that are sharp and acetous, fall down more readily into the same part by reason of its debility. But

But to the *Saline Procatarxis*, or foregoing cause of this Disease, lying in the Joints; not only the weakness of the distemper'd member, but much more and first of all, the evil disposition of the Blood doth help. We shall weigh a little the reasons, and the manner how it is done, of either.

1. And in the first place, the fault of the Blood is, that its elementary Particles, and chiefly the Saline, are not in a fit state or condition. For they ought to be within the mass of the Blood, in the middle betwixt a fixed and a volatile constitution: they are called fixed, so long as the Sulphur and Earth being combined, do pertinaciously adhere to them; as it is observed in fresh and raw Urine, from which you shall not easily draw by distillation, either Salt or Spirit: But the saline Particles are volatilised, when leaving the Sulphur and Earth, they adhere to the spirituous, and with them fly away; as it is seen in the spirit of Urine, being distilled after a long digestion. Then there is a middle constitution between these, when the Saline Particles are so loosened and dislocated from the Sulphureous and Earthy Particles, that upon occasion they may be easily laid hold on by the Spirituous, and ascend together with them; as it is in Urine putrefied by digestion, from which with a very little heat, you may force out Spirit and Salt. In like manner the Saline Particles in a living body, seem first of all to be in a degree of fixity, within the *Chyle*; from which, notwithstanding, through Concoction in the Bowels, being rightly made, they begin to come forth a little. Secondly, these are made volatile in the nervous juice: And, Thirdly, they are of a middle constitution in the bloody mass; to wit, which are exalted by a continual circulation or digestion, so that they are in some manner volatile, that being associated, partly with spirituous particles, and distilled forth with them into the Brain, they go into Animal Spirits; and partly going into the nutritious juice, together with the sulphureous and others, they increase in their nourishing the solid parts.

But sometimes it happens, that the saline Particles (at least not all) are not rightly exalted within the bloody mass, but remaining in a state of fixity, give a beginning or cherishing to many Diseases. That we may say nothing of the *Scurvy*, *Dropfie*, and many others, we only say for the present, it may be suspected, that the first seeds of the *Goutish* distemper depend upon this cause; for when the nervous juice, being destined to the heads of the bones (where it is chiefly received) ought to consist of very much Salt, there is a necessity, that its Particles, because they are too fixed and thick, cannot be admitted presently into the Pores and passages, should increase into a Morbific Mine. Besides, that more easily and more often happens, if the weak or broken Fibres of the bodies, planted near, cannot by wrinkling themselves, shake off what is troublesome or superfluous.

As to the secret leading or evident causes, from which the nutritious liquor being brought from the blood to the joints, is imbued too much with a fixed Salt, and by reason of which, these parts become too prompt and easie for the receiving what is impropportionate to them, the chief of these, for that they are various and manifold, we will briefly touch upon.

1. And first of all, an hereditary disposition is wont to produce either evil. For those troubled with the *Gout*, for the most part beget Gouty Children, and this Disease descending from the Parents to the Children, is wont not only to have the like fruits in both, and also to ripen about the periods of the same age; but for the most part, it hath its first roots in the same members, and observes every where the like progresses: concerning the reason of which, I think, we have already said enough, being the same as other Diseases propagated *ex radice*, or from the Parent.

2. But indeed, the *Gouty* disposition is brought in oftentimes without any original fault, by reason of an evil manner of living, and errors in the six *non-naturals*. For those who are given to Surfeiting and drinking much, and indulge their appetites by an inordinate eating and drinking, and especially if they feed on salt and spiced meats, and guzzle down great plenty of Wine, easily contract this Disease. For by this means, the *Chyle* is indigested, and indued with very unfit and untameable Particles, and so ill prepared in the Bowels; and then from a more liberal drinking of Wine, saltish settlements and heterogeneous feculences or dregs, which subsist somewhere in the first passages, being too much exalted, are carried into the Blood: to which enormities of living, if a sedentary life, idleness, or sleeping at noon be added, so that the superfluities neither exhale, nor the *Saline* impurities are dissipated by exercise, but left to settle about the joints, certainly too much of this *Alcalisate* seed is sowed for a plentiful harvest of this Disease of the *Gout*.

3. The debility of the little Joints, and *Goutish* disposition is not only hereditary, but excited frequently by reason of various occasions. The falling down of the Morbific matter often induces this: for if by chance it happens, that at first, the fit of the *Gout* comes

To this previous procatarxis, to wit, a fixed Salt, the Disturbance of the blood, and the debility of the distemper'd Member doth help. What the Saline Particles of the blood ought to be, to wit, in a middle state, between fixation and volatilisation.

When, being too fixed, they become Morbific.

And so they bring forth the Scurvy, Drop-sie, and other Diseases, and especially the Gout.

The Saline fixed, or Artbri-tical Disposition of the Blood, proceeds from various Causes, 1. Sometimes it is Hereditary.

2. Oftentimes acquired, by reason of an evil manner of living.

From what Causes the debility of the Joints is excited.

comes in this or that part, afterwards the peccant humor more easily falls down into the same member; and quickly constitutes, as it were, a nest, where the Eggs may be continually laid up. Besides, a solution or breach of continuity also, or some hurt inflicted on any joint, by wet, or cold, by a blow, or putting out of joint, oftentimes stirs up the *Goutish* disposition.

2. The other foregoing Cause of the Gout, from the acetous part of the nervous humor.

Secondly, But indeed, as the Blood brings a *Saline* Mine for the Morbid seed, and the Joints receive and hide it readily; yet this provision, without the coming of the other seeds, is like an addle Egg, wholly barren and unfruitful; because, for the constituting of this Disease into act, it is required, that the nervous liquor, by chance swelling up or growing turgid, pours forth *Saline* impurities of another condition, to wit, acetous, falling away with a certain effervescency, or heat, and as it were a firing of the other Mine. Wherefore, we think good to set down this other foreleading cause of the *Gouty* Disease in the nervous humor, and its acetous or sharp affluxions, or flowing to the parts.

Such an acetous disposition does not come upon the whole Mass of the nervous humor, but only some portions or recrements of it.

And indeed, that the *Saline* Particles of this Liquor degenerating from a volatilization to a flux, do become acid, we have shewed by very many instances and reasons; both formerly, and also in this Tract. But for the provision of this Disease, it is not requisite that the whole Mass of the nervous juice should be acetous; but it is sufficient, that some portions of it in the Brain, or elsewhere in the nervous stock, being depraved, or that its Recrements laid up here and there, had contracted this kind of Nature, from which afterwards growing turgid, when as the acid Particles run together to the *Saline* Mine laid up in the Joints, they stir up the *Gouty* fit after the manner aforesaid.

It is shewn that acetous fluxions do proceed from the nervous humor.

But truly, it manifestly appears, that *acetous fluxions* being brought from the nervous humor, do frequently happen; by a notable instance or experiment, often cited by me; viz. I have often observed, That those obnoxious to the passions or pains of the Nerves, have suffered or felt a light rigor or stiffness in their whole Body (which is a corrugation or wrinkling of almost all the nervous parts) and then presently, the Convulsive Distemper would follow; at which time the Urine was rendred very copiously and clear, which being without any lixivial or nitrous savour (which otherwise it always has) was very sharp, like mere Vinegar: indeed by this most clear sign it appears, that the humor being risen up to a fulness in the nervous parts, and moved by its swelling up, doth bring in the Convulsive Distempers; and when a portion of the same sweating or dropping forth, is laid up in the *Glandulas*, immediately being reduced thence into the Blood, by the passage of the Veins and *Lymphaducts*, it did excite the flood of the sharp Urine: Indeed in like manner, from the same humor swelling up in a lesser measure, and still remaining within the nervous passages, and settling in the Joints, we think the *Gouty* fits do arise.

And so part of the *Gouty* Mine is sent from the Brain and Nerves.

Indeed it is an argument, that part of the *Goutish* matter doth proceed from the Brain and Nerves, because for the most part, those obnoxious to this Disease, do complain a little before the fit, of an heaviness of the head, and of a dulness, with a *Vertigo*, and sleepiness; but as soon as they begin to suffer the pains of the *Gout*, as if the Clouds were blown away from the Brain, they enjoy a more free understanding, with a great and unwonted sharpness of wit. Besides, when as there are sometimes many *Saline* Mines of this inveterate Disease, deposited in diverse Members, it is observed, that the pains do very much invade, first the superior places, and then by degrees descend to the rest; wherefore, when perhaps at first the *Vertebra* of the neck were troubled, a little while after the shoulders, or other members of the Arm were possessed, then the Disease reached to the Loins, or the Hips, and lastly the joints of the Legs, and so to the lowest joints, sometimes these, and sometimes those.

The evident Causes of the *Goutish* Fit.

The *Evident Causes*, which in respect of the nervous liquor stir up the *Gouty* Fits, do either pervert the Particles and portions into an Acetousness, or else stir them up before degenerated into Fluxions.

1. The drinking of sharp Liquors.

1. Acid liquors, as thin Wines, Cyder, stale Beer (experience being mistress) are to be shunned by *Gouty* persons, more than a Mad-Dog, or a Snake. For these kind of Drinks do not only bring into act the cause of this Disease, but contribute more Acetous Particles, (by carrying them to the Brain, and nervous Fibres) to its nest, and increase the Morbific matter.

2. Immoderate Exercise.

2. Immoderate or unseasonable exercises of the Body, violent passions, immoderate Venus, and a disorderly feeding, and whatsoever besides greatly disturbs the spirits and humors or shakes them, and by that means stir up the fluxions of the nervous juice or its recrements, induce the pains of the *Gout*.

3. Evacuati-
ons being sup-
pressed.

3. Usual evacuations being suppressed, also taking of cold and wet, for that by this means the blood, and by consequence the nervous liquor, conceive effervescencies and fluxions, do bring on the fits of this Disease.

4. For

4. For the same reason, the changes of the Heaven and of the Air, as also the *Tropicks* of the year, are wont to bring on the pains of the *Gout*; so that it is become a Proverb, That *Gouty* persons carry their *Almanack* in their joints; and deduce most certain *Prognosticks* of the weather, from their pains: For as often as the humid constitution of the year, or the blowing of the Southern, or the Northern Winds, or Snow, are at hand, they are wont to predict these from the coming of their pains. Further, every Quarter of the Year, especially Spring and Fall, they are more grievously tormented. Wherefore the *Aequinoxes* are always religiously observed by them. The reason of these consists partly in this, forasmuch as insensible perspiration is variously altered, by reason of the mutations of the Air and Year; therefore the Effluvia's which are wont to transpire, being restrained, do ferment the Blood and the nervous Humor, and easily stir them up into *Goutish* Fluxions. Besides, the humors of our Bodies, even as the Sap of Vegetables, and other natural and artificial Liquors do diversly grow hot, about the changing of times, and enter various states or conditions of either fixation, or sometimes of volatileness, or of a flux.

4. The Circulations of the Heavens, Air and Year.

The chief differences of this Disease, are taken from the distemper'd places, and so there are ordained as it were distinct *species* of the same, to wit, the *Chiragra* or Hand *Gout*, the *Ishia* or Hip *Gout*, the *Gonagra* or Knee *Gout*, and the *Podagra* the Foot or Toe *Gout*; in the mean time, pains are wont to be excited in some other members, and are noted by the common name of the *Gout*. Whether the pains of the Teeth, or of the Loins, and pains of other parts ought to be referred hither, we have not now leisure to inquire.

The differences of the Gout

1. As to the places affected.

This Distemper, as to its original, is said to be hereditary, or acquired; as to the temperament of the sick, it is Hot or Cold, or *Sanguine*, *Cholerick*, or *Phlegmatick*, to wit, because the Blood being hindered in its circuit, about the distemper'd places, sometimes an Inflammation, or a watry swelling come upon the pains.

2. As to its Original.

As to the relation of other Diseases, the Distemper of the *Gout* is either singular, or else complicated with other Diseases, and chiefly with the *Scurvey*, or the *Stone*. Of which kind of combinations, because they are intimate and frequent (as if they were of kin to this Disease) it will seem to the purpose, for us to inquire into the reasons.

1. In respect of other Diseases.

A long *Gout* oftentimes gets to it the *Scurvey*, and some *Scorbutick* Distempers are so like the *Gout*, that they are not easily distinguished. The reason of the former is, both the like *Dyscrasie* of the Blood in either Distemper, depending upon a fixed Salt, as also for that *Gouty* people, being for a long time fixed either to their Bed or Chair, the *Scorbutick* disposition easily comes upon them. Secondly, The *Scorbutick* Distempers which imitate the *Gout* are the *Rheumatism*, and the wandring *Scorbutick* *Gout*; the reasons and causes of which, and how they may be discerned from the *Gout*, we need not repeat here, having already delivered them in our tract of the *Scurvey*.

It is wont to be complicated with the Scurvy.

The *Gout* hath so near a relation to the *Stone*, or *Gravel* in the Reins, that either distemper, as if they had the same original, most often meet together; for scarce any is sick of the *Gout*, but is found to be also obnoxious to the other Disease. Further, an inveterate *Gout* is wont to excite stony Concretions in the Joints, such as the *Stone* doth in the Reins. Hence I think it is most likely, that the *Stone* or *Gravel* in the Reins, doth arise from a like, if not wholly the same cause, that we assigned for the *Gout*, to wit, the Saline fixed matter, being deposited from the Blood, in the Reins, doth grow hot with the acid humor, being there poured forth thorow the nervous passages, and by that means doth frequently induce *Nephritick* pains, or of the Reins; then, from either matter being coagulated, after growing hot, doth form the *Stone*. For the illustrating this *Pathology* farther, (here being no place for it) it shall be deferred to another time.

2. With the Stone.

The Reason of this is shewed.

Every Body is wont to give a *Prognostick* of the *Gout*, to wit, that it is safe enough, but most hard to be Cured. 1. As to the former, this Distemper is not only free of it self from danger, but on the contrary, preventeth most other Diseases. For *Gouty* people, by reason of the Saline fixed *Dyscrasie* of the Blood, are little obnoxious to *Favours*; but for the most part live free from a Consumption, and other more grievous Distempers of the Bowels or Head; because the Recrements of the Blood and nervous Juice are continually laid up in the Joints. 2. But as to the latter, the so great difficulty of Cure, the reason is, that for the taking away the foregoing cause of this Disease, there is required a most perfect amendment, of a double Humor, viz. of the Blood and nervous Juice; to wit, that they may beget no Saline fixed or plainly acid Particles; and moreover, a restitution of the weakned Joints; neither of which can ever be easily obtained. And besides this, it happens, that the Conjoint Cause of this Disease subsists in places greatly at a distance, so that the virtues of no Medicine are able to reach them.

The Prognostick of this Disease.

The Gouty Matter being restrained, or any other way translated, oftentimes excites dangerous Distempers.

The acetous recrements of the nervous Liquor do chiefly effect this.

The first Instance of such an Effect.

A second Instance.

The Cure.

Three primary Indications.

1. Curatory, for the allaying the pains in the Fits.

1. For the taking away of the Breach of the Continuity.

Phlebotomy.

Sometimes it happens, by reason of the Fluxions of the Gouty Matter, being suppressed or beat back, that sometimes torments of the Ventricle, of the Bowels, and of the Belly, sometimes a straitness of breathing, an *Asthma*, or other Distempers of the Breast, and sometimes also an *Apoplexy*, and other sleepy, or Convulsive Diseases are excited; which being observed, it may be objected, that the Mine of the Gout is not the same as we but now described: because its *Saline* part, if it were the same which is destinated for the nourishing of the Joints, would not be from thence expelled or deferred, or laid up elsewhere; then as to the other part, to wit, the laying up of the acid seeds in the accustomed place, it seems that it should not be easily repercussed, or of it self suppressed in its way, or any where else translated, to be very hurtful to any part. But indeed, it is easie to reply to this, that an acetous portion of the Gouty Matter, may be repelled or suppressed, flowing thorow the nervous passages, and so it being poured into other parts, doth oftentimes excite most grievous evils. Indeed the nervous Liquor and its Recrements, for that they consist of very subtil and active Particles, upon every light stop or repulse, are driven into diverse deflections and flowings; moreover, when these grow turgid, or meet with the Particles of humors of another kind, and grow hot with them, they stir up various Distempers, or such as are painful and Convulsive; and not rarely, because the dissimilar Particles are mutually coagulated, sometimes *Serumons*, sometimes *Cancrous*, or otherways malignant Tumors arise. Instances very remarkable of these kind of effects, we have shewn in our Treatise of *Convulsive Diseases*; But especially concerning a Maid, who by reason of the *Inguinal Glandulas*, or the Kernels about the Groin, being hardly pressed and hurt with a Truss for a Rupture, fell into a *Vertigo*, and Convulsive Distempers, and shortly after had great *Scropula's* or running Sores, growing on the same side, in the Neck. After the same manner, by reason of the Goutish Mine being restrained from its wonted place, and suppressed within the nervous Passages, or otherways translated sometimes most wicked Distempers arise.

Whilst I was writing these, I was sent for to a Noble Matron, who sometimes past being obnoxious to the Gout, and that very much, after about three months last past, she had laboured almost continually with a languishing of the Ventricle, with a queasiness, nausea, and vomiting; at length, I know not upon what occasion, falling into frequent swoonings or loss of spirits, a little after she was troubled with a *Vertigo*, with a loss of memory, and sometimes with a light *Delirium*; and when she had continued thus for some days, and free in the mean time from the Gout, and growing well in her stomach, she eat with an appetite broth twice or thrice in a day, and once a day flesh meat, and digested it without any trouble: by this manifest sign indeed it appears, that the Recrements of the nervous humor, which were wont before to fall down by the *Spinal Nerves* into the Feet, to the Mine of the Gout, afterwards being deposited in the *Ventricle*, thorow the Nerves of the wandering pair, and the *Intercostals*, did stir up the continual troubles in it; which at last partly restagnating in the Brain, and being partly translated into the *Cardiack Nerves*, (or those going to the Heart) those last Distempers of Swooning, of the *Vertigo*, and the *Delirium* succeeded.

The Curatory method suggests three primary Indications, the first of them Curatory, to be administer'd only in the Fits, for the allaying the pains, and for the sooner ending of them. Secondly, *Preservatory*, being destinated for the intervals of the fits, endeavours the taking away of the foregoing cause of the Disease, that the fits of the pains may more rarely, or less, or not at all be repeated. Thirdly, *Vital*, which institutes, by what kind of food, and by what Remedies, strength may be sustained in the cruel Torments, and life be prolonged, and also refreshed or cherished, notwithstanding the frequent and almost continual troubles of the Disease.

1. The first Indication, to wit, the allaying of the pains, contains these two chief intentions, to wit, that the breach of the unity be taken away; and in the mean time, that the irritation, or the growing hot of the Fibres, or of the Spirits flowing in them, may be quieted or appeased.

1. For the taking away of the breach of the unity in the distemper'd places, both the flowings of the humors, which are apt to tend thither, ought to be hindered, and the Mine already impacted to be dissipated, and shaken off, and its Particles suppressed, from their mutual effervescencies or growing hot. For these ends are destinated, evacuating and altering Remedies, and of either both internal and external. We shall here add some forms of these, and the more select ways of administration, in their order.

Phlebotomy or letting of Blood, in a fresh Gout, or not very inveterate, and especially in a more hot constitution, being used about the beginning of the Disease, doth often bring help; but in an habitual Disease, and in a frigid temperament, and old age, it is

is wont to be more hurtful than profitable; because it depresses the vigor of the Blood, and of the Spirits; not too much raging, without a lessening of the Morbific matter.

The business is very much controverted concerning Purging about the beginning of the Disease, whilst some Physicians most strictly abstain from all Purging, before the declination or end of the fit; others on the contrary, constantly give strong Purges about the beginning of the Disease, and oftentimes with good success. The reason of the difference seems to be placed chiefly in this, to wit, because some Gouty persons are yet firm in the constitution and tone of the humors, and the Vessels containing them, and being not yet weakned in their joints, as often as the Blood and nervous Liquor are disturbed by Medicines, their superfluities and recrements are not presently precipitated into the Mine of this Disease, yea these being provoked by the Medicine, and also obeying the incitement, are drawn forth by the mouths of the Arteries, into the cavities of the Intestines; and in the mean time, the Vessels being emptied, they draw or sap back a certain part of the Morbific Matter. But it is otherwise in tender and weak Constitutions, for from the least commotion of the Medicine, the purgings of either humor fall down into the Gouty place. Therefore to whom Purging is convenient, it ought to be instituted with the more strong Medicines, and *Elaterium*. For this matter, these are Forms of Pur- of known use. The Electuary *Caryocostinum*. The Purging Syrup *de Ramno*. Pills of *ges*. *Hermodyctyls*. The Compounded Pill *ex Duobus*. The Pill of *Rhasis*; which if we may believe the Author, will quickly make the sick to walk. Take of the best Aloes half an ounce, of red Roses two scruples, of *Hermodyctyls bark* one dram and a half, of *Diagridium* one dram, of Honey of Roses what will suffice; make a Pill. Roderick of Fonseca, wonderfully crys up the root of black Hellebore, and among other things, an Apple with its small strings put into it, to about half a dram, roasted under the ashes, and so eaten.

Take of Calomelanos one scruple, of the Resine of Jalap three grains, or of Scammony three grains, of the Oyl of Cloves one grain, of the Balsom of Peru what will suffice; make three or four Pills, for one Dose.

In the time of Purging, it will be of some moment, perhaps, as Solenander advises, to restrain the falling down of the humors into those places, by a Plaster, or other defensive Medicine, laid upon the distemper'd places.

Vomiting, to whom it is wont to be safe and easie, may be also convenient in this Vomiting. Disease; for which end, the Emetick Tartar of Mynsicht, the Sulphur of Antimony, or its Flowers, *Mercurius Vite*, *Vinum Emeticum*, *Gambogia*, may be administer'd.

But in the Goutish fit, the Powders of Stones, Bones, and Shells, as also of sharp Vegetables, do help; which being called the *Alexiteria* of this Disease, subjugate all the Particles, and by growing hot with them, do as it were mortifie them, and at last they being overcome, they carry them forth either by Urine or Sweat.

Altering Medi- cines, or such as preserve from the Gout.

Take of the Powder of Crabs claws compounded two drams, of Ivory, of the Root of Cre- tick Dittany, of the Root of male Pæony, each one dram; of the Wood of Aloes, of yellow Saunders, each half a dram; make a Powder, let it be taken half a dram or a dram, either by it self, in a spoonful of red Poppy Water, drinking after it six spoonfuls of the same, or let it be reduced into a Bolus, or Pills, with *Andromach Treacle*, or Venice Turpentine what will suffice: the Dose one dram twice a day, drinking after it of the distilled Water afterwards described two or three ounces.

Or Take of the same Powder six drams, of the Conserves of Gilliflowers, and of Betony, An Electuary. each one ounce and a half; of *Diascordium* one dram, of the Syrup of Poppies what will suffice; make an Electuary; the Dose one dram to two, Evening and Morning.

In the mean time, while these things are doing, besides, altering Medicines, and allaying, have their turns, for the calling away to some other place, the flowing of the Morbific matter into the places distemper'd, or for the carrying it forth; such as may allay the swelling up of the Blood, and the nervous Juice, and stop the Fluxions of the Recrements falling from them; for this end a slender diet, and spoon meat (if it be convenient) being ordered; let Emulsions, Juleps, and Apozems made of gentle things, and Anodynes, be prescribed.

As to what belongs to the other intentions of healing, viz. the Discussion of the im- packed Mine, and for the allaying the burning or growing hot of the Fibres and the Spi- rits; this latter must be endeavoured, without which, being performed, the other in- tention will not satisfie: for this end therefore it is expedient, to give both external Medicines, viz. Topicks of a various kind; as also internal, viz. Hypnoticks.

2. The Spirits ought to be al- layed, or qui- eted.

For that there are an immense company of Topicks, these are only Anodynes, which re- spect 1. By Topick Remedies.

spect only the pain by it self, or are such as aim at this together, and the tumor; or they are repelling, or resolving, and discussing: There are various *Formula's* of every one of these, and ways of administrations: But the chief in use are *Fomentations*, *Pultesses*, and *Plasters*; of these we shall shew the most celebrious; and first of all, *Anodyne Applications*, which please the Fibres with a certain delight: For this use the most common practice with the vulgar are, *Cataplasms* or *Pultesses* of Milk and crums of Bread, or of those with a *Mucage*, or jelly of the leaves and of the roots of Mallows, and Marsh-mallows, and such like.

Others praise a *Pultesse* of the fresh dung of a Cow applied warm.

Pultesses.

A Fomentation.

Take of the Water of Nightshade, and of the Sperm of Frogs, each six ounces; mingle them: Lint being dipt in this, let it be applied warm.

Take of red Lead three ounces, of distilled Vinegar one quart; let them digest for several days; and use this liquor by it self, or else the water drawn off by distillation.

Also a Water distilled, made of a Tincture of Verdigrise, distilled in Vinegar, often times allays the pains.

I had from a Gentleman, oftentimes heavily obnoxious to the Gout, that he in the most cruel torments of this Disease, had always present ease, from a Fomentation, of the water distilled from the contents in the stomach of an Ox fresh killed.

Outward Narcotics.

For the extremest torments of the Gout, outward *Narcotics* ought sometimes to be applied. Take of the leaves of Henbane, and of Hemlock, each three handfuls; let them be put into boiling water, and as soon as they grow tender let them be taken out: These being bruised, add to them, of the Powder of Chamomel flowers about two drams, and the yolk of one Egg; make a *Poultesse*.

Or take of the Tincture of Saffron, made in the Spirit of Wine four ounces, of Camphor, of Opium, each one dram; let them digest close shut and warm, till they are dissolved; anoint the pained part with this liquor. There are to be found other innumerable Medicines of this sort in Medical Books, and are every where ordinary, and wont to be prescribed almost by every vulgar person; which also suffices for the fulfilling of the other Intention, to wit, the repercussion of the Humors, when it is seen necessary.

Resolving Topicks consisting chiefly of Saline Particles, even analogic, or correspondent to the Morbific Mine.

As to what respects *Resolving* and *Discussing Topicks*, they are not required to be of the same kind, which open only the Pores, and evaporate the Serum, and make the Blood circulate, as in an Inflammation, or a white hard swelling; but whose *Saline Particles*, being destinated for the opposing those Salts of the Goutish Mine, may either by embracing them carry them forth of doors, or by precipitating them may suppress them from their painful heats. Wherefore in this Disease, when Fomentations or *Pultesses* of Chamomel, Mallows, Marsh-mallows, Line and Fenegreek seeds, bring little or no help; yea by loosning the nervous parts, do oftentimes much hurt; the Salt of Armoniack, or Sea Salt, or Nitre, or of Vitriol, quick Lime, and dissolutions of the like, or distilled Liquors, always troublesome to other humors or pains, are wont to give the greatest help.

Forms of these.

These kind of Liquors in the Goutish Fits, to be applied to the grieved part, are variously prescribed, by *Quercitan*, *Crollius*, *Hartman*, and other *Chymists*; and as other famous Physicians have often found them by experience good, and approved of them, we may conclude that they are helpful for the afore said reason.

There will be no need here to repeat the forms of these, though I could easily set down many other preparations of this sort; yet I shall here give you one or two of them only.

Take of Sal Tartari, and Armoniack powdered, each two ounces; put them into rain or spring water two quarts, and with a linnen cloth dipt in it warm, apply it.

Take of the Spirits of Vitriol not rectified one pint, of Sea Salt calcined and powdered one pound; distil them in a Glass retort in sand; a very pure Spirit of Salt will come forth, which being expulsed from its lodging by a Vitriolick Stagma, leaving the possession, easily ascends: To the dead head pour two pints of the Spirit of Wine, digest it close and warm, adding of Camphor two drams; let it be applied warm to the grieved part with linnen rags.

Take of the Filings of Iron, of the Flowers of Sal Armoniack, each six ounces; mingle them well by pounding them together; let it be distilled in a Glass retort till the Flowers are sublimated; to the Caput Mortuum being pounded, pour the Spirits of Wine, digest it, and keep it for use.

I have

I have heard of some that for the allaying of the pains of the *Gout*, have inclosed the distempered foot in a little Bay, filled with Sea Salt calcined and powdered; from which they have still expected a certain and sudden help.

In the declination of the Fit, for the strengthening the part, and for the shaking off the reliques of the Morbific matter, Plasters are profitably applied; which however are not all convenient to all, but for some more, for others less hot; But the most efficacious to most people are those in which are *Red Lead*, *Ceruse*, and *Soap*, boiled with *Oyl*. Or Take of the Plaster of Red Lead two parts, of Paracelsus one part, mix them, and spread them upon Leather.

Plasters in the declination of the Fit.

2. Internal Remedies for the pains of the *Gout*, that are made use of, are only *Narcotics*, or such as stupefie, which ought to be administer'd in cruel and long torments. Of these we shall chiefly commend Preparations of *Opium*, with Salt of *Tartar* or its Tincture. Further, for this use, the *Laudanum* of *Paracelsus*, or that of *London*, Pills of *Syrax*, and *Cynogloss*, or *Dogs Tongue*, *Syrup de Maconio*, or of *Poppies*, *Treacle Andromach*, and *Diascordium*, are wont to be helpful or give ease.

Opiates.

The Indication Preservatory, or so called, respects the taking away of the foregoing causes of the *Gout*; wherefore, that the fits of pains may more rarely, or less or not at all infect them: For this end, *Evacuating*, *Altering*, and *Corroborating* Remedies, together with an exact dyet, are prescribed to be given out of the Fits.

2. The preservatory Indication, out of the Fit.

1. *Gouty* people therefore ought constantly to be purged Spring and Fall; and then also it will be expedient to Vomit, if nothing gainsays it; and sometimes afterwards at intervals, to repeat them. Let those who are indued with a more strong stomach and *Præcordia*, take Emetick Minerals prepared out of *Antimony* or *Mercury*. Those who are of a more tender constitution, may take after the eating of slippery meats, Wine of *Squills*, or the Salt of *Vitriol* with Posset-drink; and then the stomach being filled with warm water, or simple Posset-drink, or with the leaves of *Carduus* boiled in it, let Vomiting be twice or thrice or oftner provoked. For Purging to be often celebrated also at convenient times, between, the forms of purging Medicines already prescribed are convenient enough. Or Take of the strings of black *Hellebore* cleansed one ounce, of *Lignum Aloes* and of *Cloves*, each two drams, bruise them, and pour to them of the Spirits of Wine, not rectified, one quart; let them digest warm and close shut, for several days. The Dose two or three spoonfuls in the morning, twice or thrice in a week; and let Vomiting and Purging be always begun before the *Æquinoxes*, lest perhaps the Fit being first begun should pervert the course of the Medicine.

Usual Purging and Vomiting.

Letting of Blood, or the opening of the *Hæmorrhoidal Vessels*, are sometimes convenient Spring or Fall, in an hot temperament, and for such as are indued with a more sharp Blood. *Cauteries*, made in the Arms, and between the shoulders, are profitable to every one almost obnoxious to this Disease.

Phlebotomy.

But besides, altering Medicines, *Antidotes* so called by the Ancients, against the *Gout*, are of known use; and in a long time, together with an exact method or Government concerning the fix non-naturals, often bring great help; in this rank the chief are Medicines indued with a *Volatile Salt*, and *Balsamick Sulphur*, forasmuch as these exalt the fixed Salt, and reduce what is *Acetous*; besides, bitter and astringent things, as these Herbs, *Chamæpitys*, *Centaury*, *Germander*, the Roots of *Gentian*, and *Aristolochia*, or *Birchwort*, &c. (as by experience has been approved of in this Disease) for this reason seem to be profitable; because they help the offices of *Concoction*, and *Chylification*, or making of *Chyle*; and restrain the *Saline fixed seculencies* or dregs, that they may not be carried into the Blood. We shall here set down some forms of each of them.

Altering Medicines called Antidotes of the Gout.

Take of the Powder of *Chamæpitys* six drams, of *Crabs Eyes* two drams, of *Venice Turpentine* Pills. what will suffice, make small Pills, take three or four Morning and Evening, for thirty or forty days, drinking after them of the following distilled water two or three ounces.

Take of the leaves of *Cypress Tree*, of the *Ash*, and of *Mistletoe* of the *Apple tree*, each six handfuls; of the roots of sweet smelling *Avents*, *Burdock*, each one pound, the outer rinds of ten *Oranges*, and of six *Lemons*, of *Nutmegs*, and *Mace*, each one ounce; let them be all cut and bruised, and pour to them seven pints of new Milk, and of *Malaga* one pint; let them be distilled according to art, and the whole liquor mixed together.

A Distilled Water.

Or let there be a simple Water prepared of the leaves of *Burdock*, by pouring it twice or thrice upon fresh leaves.

Take of the Powder of the Seeds of *Burdock* six drams, of *Crabs Eyes* two drams, of *Nutmeg* half a dram, of *Captive Balsom* what will suffice to make a Mass, which form into small Pills: let four be taken Evening and Morning for many days.

Take of the Tincture of *Antimony* one ounce; the Dose twenty drops to twenty five, Evening and Morning, with three ounces of the water but now described.

Tinctures.

Powders.

For poor people I was wont to prescribe after this manner. Take of the Powder of the leaves of Sage half a pound, of Crabs Eyes, and of the Sugar of Crystal, each two ounces; mix them; let it be kept in a Glass, and take one spoonful twice in a day, with a draught of a Decoction of the leaves of Sage, or of the roots of the Burdock.

Or of the Powder of Dorncrellius prescribed to be taken after the same manner.

Take of the Powder of the leaves of Germander, of Gout Ivy, of the lesser Centaury, of Marjoram, of Sage, of Betony, of the roots of Gentian, and of round Birthwort, each one ounce; of Sugar one pound; mix them and make a Powder.

Or of the Powder of John Anglicus, called by himself Saracenick.

Take of the Powder of the leaves of Chamapitys, one ounce, the bones of a Mans foot burnt two drams, of Liquorish three drams, mix them.

Medicated Beer.

For ordinary drink, let there be prepared a Bochet of Sarsaparilla, of Saunders, wood of Rhodium, shavings of Ivory, Harts-horn, &c. or let there be prepared small Ale, in a Vessel holding about four gallons, instead of Hops let there be boiled the leaves of Germander and Chamapitys, and after it has work'd, put into it of the leaves of dry Sage four handfuls, of Sassafras two ounces, of the roots of sweet smelling Avena eight ounces.

A Milk Diet.

Among Altering Medicines a Milk dyet has not the last place, that the Patient should use for three or four Months, no other food: let him drink Morning and Evening new Milk from the Cow; about noon, and at other times, let him eat white Bread boiled in Barly, or Water-gruel of Oatmeal: I have known some by this kind of dyet to have received notable help; but others, to have received much hurt or to grow worse, by the use of Milk, and the Gout being nothing cured, to have contracted great obstructions of the Viscera, and a Cachochimical disposition or fulness of evil humors. Therefore this method is not rashly to be entered upon, without the counsel of a prudent Physician, and by a sedulous observation, whether it be convenient or not.

Drinking of ones own Urine.

Of late it has been a common custom, for people having the Gout, to drink every Morning their own Urine; which I know has been beneficial to some. The reason of which help seems to be, because the Saline Latex of the Urine, passing thorow the Blood, doth carry with it to the Reins, the Saline fixed Particles that were before wont to be carried into the joints. Wherefore, this method, when it is helpful to the distemper of the Gout, for the most part encreases the Stone: which I think sufficiently appears from the following History.

A notable History of the Stone converted into the Gout, and on the contrary of the Gout into the Stone.

A very Learned and Pious Man of this Nation, and also the glory of Learned Men Dr. H. H. after he had lived for many years, grievously obnoxious to frequent fits of pains, of Vomiting, and a making of bloody Urine, at length by the constant use of the following Remedies, he lived above seven years almost free from the Stone, and without any grievous Fit. The method of Cure which had been taught him by a certain Gentleman, was after this manner, without any Physick or medicine, abstaining from Wine and Cyder; he drank for his ordinary drink small Ale, made of Oaten Malt; further, once in a week in the Morning, he took a draught of the same Ale, to about a pint, with the Powder of small old rotten Bones three spoonfuls dissolved in it: By the use of these, within a few months he seemed to be in health, and freed from the Stone, but shortly after he began to be sick of the Gout, and was infested with most grievous Fits of it, all the time he was free from the Stone; and at length upon every light occasion, was become so obnoxious to them, that presently after feeding, if he exercised either his body or mind, by walking or study, he most certainly expected the Fits of his pains. The reason of which was, because the Blood being filled to a plenitude with Saline fixed Particles, and the nervous Liquor still with Acetons, when being incited, and also poured forth on the fresh nutritious juice, they grew turgid, presently they depoted their superfluities, viz. the Morbific matter of either kind, into the very weak Joints.

This venerable person therefore, being tyred out with so frequent and almost continual torture, by the counsel of a certain Friend, drank every morning of his own Urine, by the use of which, within a month or two, he was less tormented with the goutish Fits, but with an evil turn, the Distemper of the Stone began to grow again upon him, for he was from thence troubled with a pain about his Loins, with Vomiting, and a pain in making water, and a little after a total suppression of Urine followed, which being not to be helped by any Remedies, in about a fortnights time this Reverend Gentleman dyed.

The reason of this shewed by Anatomical Observation.

The Carcase being opened, all the Viscera, except the Reins appeared most sound and firm, but the right Kidney was almost consumed, a small heap of the Glandula's being only left, all the Vessels and the Ureter being joined together, and wholly shut up,

so that no Urine at all had passed there of a long time: The left Kidney being large enough, contained within the cavity and its passages, a great heap of Sand or Gravel, and little Stones; besides there was a round hard and whitish stone fallen into the Ureter, three inches deep, and there fixed, and had wholly shut out the passage of the water; the Membrane of the Ureter, where the Stone stuck, was become so thick and callous, and so free from pain, that here it could by no means be moved either upwards or downwards.

It seems in this case, that when the coagulated Particles of the Blood and nervous juice, to wit, the Saline fixed and the Acerous, meeting together at first in the Reins, did stir up for a while the Distemper of the Stone; afterwards, by the use of the above-said Powder, the saline Particles being still thrust forward into the habit of the Body, and not easily rendred, heaped together the Goutish seed-plot in the Joints, the Reins being in the mean time free. But at length, when by the drinking of his own Urine, the saline Mine was brought back into the Reins, the Disease of the Gout was changed into the mortal Disease of the Stone.

CHAP. XV.

Of the Colick Passion.

IT has been mentioned in the former Chapter, by what right we have referred this Disease among the Distempers of the Brain and nervous Stock, to wit, both in respect of the Symptoms urging, which are pain, and Convulsive motions, as also from the reason of the cause, by Charles Piso placed in the head, and truly not improbably.

Concerning the word Colick, from the Intestine called the Colon, we shall not strive, for that it is supposed, though wrongfully, to be chiefly affected in this Disease. The Distemper may be described, That it is an hauling or notable pulling of some parts of the Abdomen or the Belly; from whence a very acute pain arises, and with it for the most part, a Vomiting, as also Convulsions, and Contractions almost of the whole Viscera of the Belly, are wont to be joined. And for that the Navil, and its neighbouring parts, are sometimes as it were with a Perforation, or boring thorow, drawn inwards, and sometimes swell out, with an inflation or blowing up, and as it were with a great leaping forth; the Intestines, by an inverse motion of the Fibres, are oftentimes pulled together upwards: wherefore the Belly being extreemly bound together, renders little or nothing; yea although it be often provoked by Clysters, it doth not easily part with its contents: It appears clearly, that the Ventricle, with the Duodenum, and the bladder of Gall, are in like manner pulled, by Vomiting, and by the casting forth of great plenty of yellow or green Choler: Sometimes the Ureters, and the bladder of the Urine, are so contracted, that in all the fit, the Urine is wholly suppressed, or but very sparingly rendered: Besides, a Vertiginous Distemper of the Head, frequently preceeds, or follows the fits of this Disease: yea, the Colick growing worse, and inveterate, oftentimes causes pains in the outward members, and at length ends in the Palsie: Therefore, forasmuch as very many parts are wont to labour in this Disease, we shall inquire, which is primarily affected, and by what means the other suffer; then what is the conjunct cause of the Disease, in what place it subsists, and from whence it draws its original.

As to the part primarily or first of all distemper'd, though the Disease being urgent, the whole region of the Belly is wont to be disturbed, yet its primary seat ought to be placed, where the pain chiefly infests, and pertinaciously sticks: But this, by the consent of very many Physicians, is said to be some where in the Gut Colon. Wherefore Celsus saith, That the Colick is a Distemper of the greater Intestine; which also reason seems to perswade, something; for whether the Morbific Matter is supposed to be heaped up in the Cavities of the Intestines, or to be wholly fixed in their Membranes, certainly there are extant deep little Cells in the folds of the Colon, for its receptacles, and thick coats of this Intestine, in which the peccant humor may be deeply fastned. But indeed this opinion (to which we cannot easily assent) as also the denomination of the Distemper, seems to have grown in credit in the Schools of the Physicians, from this only, because we ordinarily observe, that the Intestines enter into pains and torments, being irritated by wind, medicines, Choler, and perhaps other humors, contained within their cavities;

Why the Colick is counted among the Distempers of the Brain, and the nervous Stock. From whence the denomination. A description of the Disease.

The seat of the Disease is not always, or often in the Intestine, or Gut Colon.

viz. neither in its Cavity or Coat.

hence, as it is obvious, may be inferred, that the *Colick* pains do arise from the sharp and provocative contents of the *Intestines*, and especially of the *Colon*. But if it were so, without doubt, those things which loosen the Belly, and draw forth plentifully the wind, and the dregs or *Feces*, should give certain ease; the contrary of which often happens, to wit, by some more violent, or often Purging, the Disease has grown worse.

Pains commonly taken for Colicks.

These are merely accidental or habitual.

These latter are properly the Distemper.

Wherefore, that the seat of this Disease, and the nature of it may be truly known, we ought first of all to distinguish here, concerning the torments of the Belly, or pains commonly esteemed for *Colicks*: to wit, these are either merely occasional, arising from a solitary evident cause, and ordinarily happen without any previous disposition to some men, and especially to those who being of a tender constitution, have very sensible Fibres, and Spirits quickly dissipated; after this manner, disagreeable or unwonted eating or drinking, also medicines, taking of cold, and many other alterations about the fix *non-naturals*, oftentimes excite great perturbations, with pains in the *Viscera* of the lower part of the Belly: which kind of Distemper, ought to be esteemed, not the Disease, but only *Symptoms* excited from a manifest cause.

But besides, the *Colick* properly so called, happens to some, not only produced by an accidental cause, but falling upon some men predisposed by a peculiar right, depends wholly upon a foregoing cause ripened by degrees. The more grievous fits of this Disease, for the most part, have their periods, and observe the changes of the Air and Year; further, being excited, they do not easily give place to any Remedies, nor quickly pass over; but notwithstanding the use of Fomentations, and though the Belly be taken down very much by *Clysters*, or Purging, they oftentimes continue with great fierceness for many days, and sometimes weeks. The pains in every fit still repeat the same part, and are followed with a concurrence, for the most part, of other the like *Symptoms*: But the pains of the *Colick*, though they have not the same seat in all, but sometimes exercise their cruelties under the *Ventricle*, sometimes about the *Navel*, or the *Hypochondria*, and sometimes in the lower part of the Belly, or about the *Loins*; yet as often as they are repeated in the same sick person, they mostly observe the same nest.

The conjunct cause of the Distemper are not the Contents of the Intestines.

Not the humors impacted in the Membranes.

For the unfolding the *Ætiology* of this Disease, it is not enough to affirm, that the *Intestines* are pulled, either by their sharp contents, or irritated by the Blood, and other humors poured into them, and breaking the continuity. For as to the former, it is extremely improbable, that the *Bile*, or *Choler*, or *Phlegm*, or the *Pancreatick* Juice, or any other simple humor, or growing hot or fermenting with others, should be able to excite such fixed, cruel, and long continuing pains: Besides, because the *Intestines* being besmeared with their own dung, cannot be easily pricked by the Contents, though sharp; nor are they wont to be exasperated by them; inasmuch that the sharpest stools, which oftentimes fetch off the skin at the Fundament, very little trouble, or not at all, the passages of the Guts; further, these being grievously provoked, whatever is troublesome, contained in their cavity, is easily shaken forth, and either by driving it forward, upwards, or downwards, is quickly thrust forth; as is plainly perceived in the Disease of the *Choler*, and other *Dysenterick* Distempers; nor indeed is there almost any loading of these provoking the Membranes, and stirring up pains, which may not be exterminated or carried forth of doors by one purge or other. Then, secondly, as to what respects the suffusions of the Blood, or *Serum*, within the coats of the *Intestines*, by which an Inflammation or painful Tumors are excited; Indeed we grant, that sometimes it may so come to pass, yea I have known it by ocular inspection; but from thence we have observed, not the *Colick* but the *Iliack* passion to have been excited. For when I have opened several dying of the *Iliack* passion, I found almost in all, that the cause of the Disease, and of their Death, was an Inflammation or Ulcer of some Intestine; neither is this any wonder, because a Solution of the continuity, in a very tender and highly sensible Membrane, doth stir up Convulsions, and painful Corrugations or wrinklins together, and so continual and cruel; that therefore the *Peristaltick* motion of the distempered Intestine, whereby the dung or dregs of the Belly are carried forward toward the *Anum* or *Arse-Gut*, should be hindered and wholly inverted.

The nervous Liquor seems most of all to contribute to the cause of this Disease.

Therefore, that we may thoroughly inquire out both the Matter and Mine, as also the seats, and the ways of flowing to them, of this Disease of the *Colick*, by some other means; it may deservedly be suspected, that it is the nervous Juice, and its Recrements; and that the rather, because this passion hath so intimate an agreement or consent with the other Distempers of the Brain and the nervous Stock, as we have already shewed. *Charles Piso* hath affirmed, That as most distempers of the whole Body, so also the pains of the *Colick*, are excited by a *Serous* heap or deluge gathered together in the head; and he contends, that the seat of this Disease, is neither in the coats nor cavities of the *Intestines*, but in the *Peritoneum* or inner rim of the Belly, and that

that the cause sticks wholly in the Brain, near the original of the Nerves. To wit, he supposes, (which he saith he hath found by *Anatomical* observation) "The serosities Charles Pisto's
"laid up in the hinder region of the Brain, to beset the little heads of the Nerves of *Opinion cited,*
"the wandering pair, and so some of the utmost branches and shoots of them inserted in-
"to the *Peritoneum* or inner rim of the Belly by the Caul, to move into Convulsions;
"and from the contraction or drawing together of this, most cruel pains, both in it,
"and in the underlying *Viscera*, as it were breaking them to pieces, to be excited. For
the proof of this opinion, he brings an example of a certain man dissected, being dead
of a most grievous fit of the *Colick*, in whom the hinder region of the head near the *Cere-*
bel, was so much drowned with a clear water; as also the nervous original of the wandering
pair, that the marrowy substance appeared very much moistened, like wet Paper, Sect. 4.
Chap. 2.

But indeed, though we should grant, that the *Colick* should arise from the humor of and examined.
the Brain, and from the default of that watering the nervous parts; yet we think that
this painful passion is excited, not after that manner as this Author has laid down. Be-
cause we think neither the seat of this Disease to subsist in the *Peritoneum*, nor its primary
cause to be within the head. For as to this, although the *Morbifick* matter being heaped
up in the head, near the origine of the Nerves, doth sometimes produce in the parts at a
great distance, Numnesses, Cramps, and Convulsive motions, as we have elsewhere shewn, by
many instances, with the reasons of the Distemper; yet it is much otherwise in a very cruel
pain, such as the *Colick* is wont to be: For as to this being excited, which always proceeds
from a breach of the continuity, it is required; that the dolorifick cause or improporti-
onate object, should be fixed in the distemper'd member itself, or at least a certain part or
portion of it: Neither is it sufficient to say, that the Convulsion proceeds from a remote
cause, and so the pain from the Convulsions: For although pain oftentimes doth pro-
duce Convulsive motions, yet these do not produce pain of themselves, at least great
and continuing long. Wherefore in the pain of the *Colick*, the matter drawing asun-
der the sensitive Fibres, and pulling them one from another, and so provoking them into
painful Corrugations or wrinklins, doth not still stay in the Brain; but descending from
thence, thorow the nervous passages, towards the *Intestines*, seems to be heaped up
somewhere in their neighbourhood, nigh to the pained parts, and there either growing
turgid or swelling up, by reason of their fulness; or growing hot with some other humor,
do bring in the fits of this Disease.

We indeed reject the Mine of the *Colick*, from the *Peritoneum*; because this Mem-
brane being very thin, and gifted but with very few and only small Vessels, is neither
capable of any great affluxions of Humors, neither can it self, though pulled together,
be able to urge the *Viscera* lying under it, into pains, by compressing or drawing them
together. But the *Morbifick* matter being slid down from the Head, by the Nerves, into
the Belly, finds very convenient nests in the *Mesentery*; in which very many and great
Nerves have there their noted infoldings and distributions: Wherefore, as this part is
very sensible, and very much obnoxious to the flowings in of the humors of the nervous
Stock, it may be deservedly affirmed to be the seat of this Disease of the *Colick*.

We have shewn formerly, the causes of some Convulsive motions in the *Abdomen*,
which are commonly called *Hysterical*, to lye hid in the *Mesenterick* Infoldings; more-
over, in the same places, we did then assert, That the *Colick* pains had sometimes their
nests, and confirmed it sufficiently by *Anatomical* observation. But the matter is some-
thing diverse, and not the same, that is wont to excite the so different Distempers of
either, under the same roof. In the Passions called *Hysterical*, we have largely declared
in a former Treatise, That the Animal Spirits being burthened with an *Elastick Copula*,
are set off, or as it were exploded one from another, and so the containing bodies are
unwillingly forced into irregular or preternatural Motions. But in the pains of the *Co-*
lick, the same Spirits, by reason of the matter troublesome to them, and improporti-
onate, being provoked, and so pulled and distracted one from another, do put the sen-
sible Fibres into very troublesome Corrugations, or wrinkling themselves together;
By what means this comes to pass in the pains of the *Colick*, also what are the conjunct, and
the foregoing causes of this Disease, and the reasons of the Symptoms, we shall a little
further explain.

Therefore we shall suppose, that for a Seed-plot or Mine of the *Colick* Distemper,
some Recrements of the nervous humor being fallen from the Brain, thorow the Nerves,
and slid down into the *Mesentery*, and other infoldings of the *Abdomen*, are there heap-
ed up; which if they be thick, and very viscous, so that they cannot be received by the
Lymphaducts or water-carriers, and so sent away, or that they cannot sweat forth by
the small shoots of the Vessels into the cavities of the *Intestines*, stagnating in those
parts, and being by degrees heaped together, do arise at length to a provocative
fulness;

The seat of the
Morbifick Mat-
ter, not in the
Brain.

The part pri-
marily affected
in the Abdo-
men, not in the
Peritoneum.
But more right-
ly it seems to be
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where the seat of
the Distempers
called Hysteri-
cal, often lyes
hid.

The Colick-mine
is affirmed to be
within the ner-
vous, and other
mesenterick in-
foldings of the
Abdomen.

fullness; then this matter growing more degenerate by standing, and becoming more infestous, grows turgid occasionally, or of its own accord, or perhaps grows hot or ferments with a *Saline fixed* humor, poured forth thither, from the Blood, torments the shoots of the Nerves, and the nervous Fibres (of which the *Mesentery* hath an infinite number) with very troublesome and painful Corrugations; which kind of Distemper of these, doth not plainly cease, till the hot or Fermentative matter being shaken off, or pressed forth into the cavities of the *Intestines*, is at length overcome.

From which, planted thereabouts, the Colick Symptoms are excited.

Further, forasmuch as from the *Mesentery* and its Infoldings, nervous shoots and Fibres are most thickly put forth into the bottom of the Ventricle, the bladder of the Gall, the *Choledoch* passages, all the *Intestines*, and on every side almost into all the *Viscera* of the whole *Abdomen*; therefore whilst the *Colick* matter grows hot or ferments in its Mines, it there stirs up torments, and oftentimes most cruel pains; and together with them in many other Membranous parts Cramps, and Convulsive or painful Contractions, are every where excited. Hence, by reason of the *Mesentery* being primarily distemper'd, a most sharp pain under the Navil shews it self, like as if a stake were driven thorow it, or a wimble a boring it; then round about almost in the whole *Abdomen* or lower region of the Belly, by reason of the *Intestines* being variously drawn down, or backwards, in diverse places together, wandring pains run about hither and thither; and by reason of the motions of the Fibres being disturbed or inverted, both in these, and also in the urinary Vessels, the Belly is almost always bound up, and sometimes a suppression of the Urine, or a rendring but a very little succeeds: yea also the *Duodenum*, the Gall-Bladder, with its passages, and the bottom of the Ventricle, being distemper'd with a *Spasm* or Cramp, and their Fibres drawn upwards, from thence frequent Vomiting, with a copious casting forth of yellow or green *Choler*, doth infest during the fit.

The yellow or green Bile or *Choler*, that is cast forth by vomiting, in the Colick-Fits, is not the material cause of this Disease.

But some do contend that this *Bile* or *Choler* (which is sometimes cast forth as green as a Leek) is the material Cause of the Disease; and that abundance of it dropping or distilling forth into the *Viscera*, doth excite the *Colick* pains in the *Intestines*. I say, that this humor about the beginning of the fit, is contained without any offence in the Bladder or bag of the Gall; but afterwards by reason of the Convulsions of the *Viscera*, being from thence pressed forth, and as it were drawn or stroked out into the Stomach, it is carried from the distemper'd Ventricle by *Vomit*; but there perhaps meeting with some other acid humor, it acquires a greenish colour, yea sometimes a blackish (as we have sometimes found by *Anatomical* observation.) And indeed, it appears clear from this, because those who are of a more cold temperament, and beget little *Choler*, when they are sick of the *Colick*, cast forth by *Vomit* little or nothing of the yellow or green *Bile*; and yet they are wont to be vexed with as cruel and sharp pains as others.

Wherefore pains of the Loins often come upon the Colick pains.

In the fit of the *Colick*, to the pains of the Belly, most cruel pains, raging about the Loins, in the bottom of the back, are very often joined; which certainly cannot arise from the irritation of any *Intestine*. But it may be easily conceived, that these are excited from the Morbific cause implanted in the *Mesentery*; forasmuch as some most noted Nerves, belonging to the Loins, enter into the greatest nervous infolding of the *Mesentery*; hence not only painful Convulsions are delivered by consent from one part to another; but besides, it is probable, that some Recrements of the Back and Loins, are derived by this passage into the *Mesentery*; and in some measure, for this reason *Scorbutical* people are so very obnoxious to pains of the Belly, and to a Flux.

In what the foregoing cause of this Disease consists.

Thus much concerning the nature and seat of the *Colick*, as also of its conjunct cause, and of the Symptoms of the same coming into act: As to what belongs to the foregoing cause, it consists chiefly in these two things, to wit, first of all for that many Recrements are heaped together in the nervous Liquor; and secondly, because they being chiefly received from the Nerves, destinated to the *Viscera* of the lower Belly, and brought into the *Mesentery*, constitute the Morbid Mines there: 1. The former of these happens for the most part, from the fault and vice of the Brain; to wit, because this admits together with the nervous liquor, *Heterogeneous* Particles, and infestous to the Animal Regiment within its borders; besides also, for that it doth not send away presently these and other ordinary Recrements by convenient sinks: Wherefore, the incongruous matter, when it cannot be otherways carried from the Brain, it most easily rushes into the most open Nerves of the wandring pair. And for this Reason it is, that Women from every inordination of the Brain, frequently contract the disposition called *Hysterical*; to wit, because the Recrements of the nervous Liquor, whether they are *Spasmodick* or Convulsive, and *Elastick* or letting off, or painful, or provocative only, being more apt to be deposed into the wandring pair, so ordinarily excite Convulsive Symptoms, like to the *Colick*. 2. Because this matter running into the pair of the wandring Nerves, is laid up in the *Mesentery*, or in other Infoldings within the *Abdomen*; the reason is, that in these

1. The nervous Liquor is in fault, because the Morbifick Matter is gathered together in it.

2. The nerves of the wandring pair, and their mesenterick infoldings, because they receive into themselves this matter.

these nervous Infoldings, many and large Nerves of the same conjugation are at last terminated: wherefore, if the Recrements of the nervous humor, subsiding here as it were upon its bottom, neither can be drawn back by any of the Vessels, nor pass into the cavities of the Intestines, there is a necessity that it must erect in this part its morbid nests.

The evident causes are of a double kind, to wit, first, those that do injury to the Brain and nervous stock, by causing a greater provision of the Morbific matter: or, secondly, those which by agitating or shaking the Blood and humors, stir up the Mines gathered together, and before quiet, and provoke them into painful heats or fermentings. It would be tedious here to examine the manifold, and diverse occasions, by which the Colick pains are brought upon those predisposed; for these often are caused by great inordinations in the six *non naturals*, and the mutations of the Air, and the Year; and moreover (by what help should be expected) by the untimely administering Medicines themselves.

The evident causes of this Disease.

From what has been said, the differences of this Disease may be easily known. For, first, by means of the causes, we have shewn the Colick to be either accidental, which is caused by reason of the Intestines being provoked by sharp contents, such as we but now described it. Secondly, By reason of the place affected, the Colick is sometimes superior, sometimes inferior, sometimes lateral or of the side, as the Morbific matter is fixed, either sometimes in this part, sometimes in that part of the Mesentery, or in other infoldings of the Abdomen. Thirdly, By reason of the sickly condition and temperament of the sick, it is called a Bilous, or Choleric, a Phlegmatick, or a Melancholick Colick; also either simple, or Scorbutick; not that these imaginary humors excite of themselves the Colick, but according to the dispositions of the Body distemper'd, various Symptoms are made, or caused to vary.

The differences of this Disease.

As to its Prognostick, it is commonly known, that the accidental Colick, to wit, excited from a solitary evident cause, is most often safe, and with an easie matter cured; but the habitual, as to its disposition, it is very difficult to be rooted out, so that the fits may no more return; and its fits sometimes are pertinacious, notwithstanding Remedies, and sometimes continue many days, yea weeks, and months.

its Prognostick.

12. The Colick disposition frequently succeeds long intermitting Feavours, and continual, being evilly handled; for that the nervous Liquor being highly vitiated, gathers together many Recrements, which are deeply deposed into the Infoldings of the Abdomen, as it were the more open receptacles. Further, for this reason, an Epidemical Feavour rages some years, to which the Colick is joined, as its Pathognomonick or peculiar Symptom: hence in like manner, a long and grievous Scurvy causes also the Colick, because it perverts the nervous liquor.

3. After the Colick pains have raged for some time in the Belly, they fall oftentimes into the Loins, and then the Disease increasing or growing worse, they enter upon the members, and the muscles almost all in the whole Body, and at length oftentimes end in the Palsie; which certainly is a manifest sign, that the Morbific matter is not carried by the Arteries, but by the Nerves; and that its subject or seat, is not the cavities or the coats of the Intestines, but the nervous Infoldings of the Mesentery: For because the Lumbar pains, or those of the side, do come upon the torments of the Belly, besides that the Nerves of either place communicate, the cause is further, for that the Morbific matter being much increased in the Head, slides down, not only into the wandering pair, but also into the spinal Marrow; and entering into it, and settling in its bottom, causes pains to arise in the Loins, and afterwards in many other Nerves, which proceed from the Spine or Back bone, and in other Members and Muscles distemper'd; lastly, it brings in the Palsie by the passages of the Nerves being stuffed by the Morbific Matter heaped up to a plentitude in them.

4. The more cruel Colick, and very much raging, whose cause is an Inflammation, or an Imposthum of some Intestine; for the most part induces the mortal Black Palsion.

The Curatory method in the Colick, as in most intermitting Diseases, suggests three primary Indications. The first of which Curatory, to be administer'd in the fit, respects the allaying of the pains, and for the sooner and more easie taking away the coming of the Disease. Secondly, Preservatory, which shews the taking away the cause of the Disease without the fit, that the fits may not be often repeated, or more grievously infect. Thirdly, Vital; which supplies Remedies for the preserving of strength in the torments, and most cruel Cruciations, and for the cherishing of the Spirits. Concerning these we shall speak a little more fully in order.

The Cure.

1. We almost only respect the Curatory Indication in the accidental Colick; for the evident cause, which is an irritation of the Intestines by sharp contents, being removed, the pains for the most part cease of their own accord, nor do they return without the like

1. The first Indication Curatory.

like occasion. Wherefore, for the quick curing of this Disease, the practice is well enough known to every common person, among the vulgar, to wit, presently to administer softning *Clysters*, *Topick Anodynes*, and *Narcoticks*; to which, if a Feavour be joined or feared, letting of blood is often used with success. We shall set down forms of these, and the order of using them in the Cure of the habitual *Colick*.

What the chief
Medical inten-
tions are in the
Fit.

Therefore, for the healing of this Distemper, in the fit, there are two chief *Intentions*; to wit, both to take away the painful breach or solution of the unity, and to allay the burning or growing hot of the Fibres, and the Spirits in them. For the former, you must endeavour, both that the matter impacted in one or more Mines, may be shaken off or subdued; and also, that a flowing in of new matter may be hindered. The second *Intention*, which ought chiefly and continually to be insisted upon, is performed by *Anodynes* chiefly, and *Narcoticks*: After what manner, and by what Remedies, every one of these are methodically to be done, we shall now shew you.

For the most
part Clysters are
to be begun
with,

Most often, the Cure of the pain of the *Colick*, and that rightly, is begun with a *Clyster*. Let this at first be gentle, and only emollient, by which the Corrugations or the wrinklins of the Fibres may be allayed, and the burning Spirits flattered or pleased. For this end, warm Milk with Sugar, or *Molossus*, or Syrup of Violets, is convenient; as also Emollient Decoctions of Mallows, Marsh-mallows, Mercury, with the Flowers of Melilot, and Elder, with the Oyl of Almonds, or of Olives; also a Decoction of a Sheeps-head, or Calves-feet: sometimes a *Clyster* of mere Oyl of Olives, or of Linseed Oyl, is wont to help before any others.

Which are at
first to be gen-
tle;

afterwards
more sharp Cly-
sters.

But if the more gentle *Clysters* do not loosen the Belly, nor are easily ejected, there must be given such as will more provoke, and press, or as it were stroke forth the humors, by the little mouths of the Arteries: For which end, let there be prepared *Carminative* Decoctions, or such as expel wind, or bitter Decoctions; in which are dissolved *Electuary Diacatholicon*, *Diaphœnicon*, or of *Laurel berries*, or *Species Hiera*: Also to these Liquors it is usual to add the Infusion of *Crocus Metallorum* three or four ounces, or of the Emollient Decoction one pint: add of *Venice Treacle* dissolved with the yolk of an Egg one ounce or an ounce and a half; or Take of sound *Urine* one pint, of *Venice Turpentine* dissolved one ounce and a half, of *Molossus* one ounce, mix them, and make a *Clyster*. I have known this oftentimes to bring great help; the reason of which seems to be, for that the Balsamick Particles of the *Turpentine* comfort the *Intestines*; and besides, being received by the Blood in the Veins, and with it circulated thorow the whole Body, moves the *Urine*, so that by such a *Clyster*, plenty of water follows, and always is rendred with a smell like Violets. Perhaps also, the Particles of the *Turpentine* being every where diffused, either move the stagnating Morbific matter, or incline the acetous, or otherways degenerate, to a better disposition.

Fomentations.

Whilst the *Intestines* are thus washed with *Clysters*, and are cherished within, Fomentations are likewise to be applied to the outer parts of the Belly. Take of the leaves of both the Mallows, of Mercury, of Pellitory, each four handfuls; of the Flowers of Elder, Chamomil, and Melilot, each two handfuls: the head of a Sheep cut in pieces. Let them be boiled in as much Spring-water as will suffice; strain it, and use it for a Fomentation, with hot linnen stuphes dipt in it, and wrung forth, and shifting them apply them by turns. Repeating them as often as the more strong pains do come upon them: In the intervals, *Pulcesses* or *Oyntments* may be administer'd.

Pulcesses.

Make a *Pulcess* of bruised Herbs, adding to it of oaten meal what will suffice; which may be laid to the belly, covering it with little square bags made for that purpose. Let one of these at a time be made hot in a pan set over hot coals, with the Oyl of Earth-worms, or of Frogs; lay them on warm, shifting them as soon as one grows cold.

An Oyntment.

Or Take of the Oyl of Earth-worms or of Frogs what will suffice; and anoint the pained part, after the Fomentation, and lay upon it a thin sheet of fine brown paper dipt in it.

Cold Fomenta-
tions.

The Caul of a Lamb, or the Lungs, or the Inwards of any other Beast, being laid warm to the Belly, and so shifted, sometimes wonderfully eases the pain.

I have observed in some Constitutions and temperaments, that Fomentations or Bathings made of hot things, and applied hot, have rather made the pains worse than eased them: wherefore in these cases, it will seem good to prescribe Fomentations of the solutions of Nitre, or of *Sal Armoniack*, or other Chymical-Liquors, as in the pains of the Gout, and sometimes (as *Septalius* says) of pure cold water.

But if the torments of the Belly do not remit by the use of these, *Hypnoticks* must be used; which being given in a just Dose, oftentimes give great truces: In the mean time, that the tired Spirits may be refreshed, and strength preserved, there must be yet insti-

Take

Take of liquid Laudanum Tartarified, from sixteen drops to twenty, let it be given going to sleep, in a spoonful of the water of Chamomil flowers, drinking after it six spoonfuls of the same water: Let it be repeated every other, or every third night, if the pains be very great. In a more hot Constitution, Take of the water of Chamomil flowers three ounces, of the Syrup of Poppies half an ounce, of Aqua mirabilis two drams; make a draught, to be taken at the hour of Sleep.

In the mean time, whilst these things are doing, for the allaying the pains, evacuating Remedies have their turns, for the discussing, or at least for the loosning the matter impacted in the morbid nests; to wit, that both the Colick Mine may be wholly extirpated; and also that the supplements or its cherishment be cut off, that they may not more increase. For these ends a Vomit (where it is convenient) and a gentle purging, ought to be ordered; and also in an hot temperament, where there is a Feavour, or where it is feared, letting of Blood.

Take of the Sulphur of Antimony, from five grains to seven or eight, of the Conserves of Borrage one Dram; let it be given in the Morning with government. In this case may be given, according to the judgment of the Physician present, either an Infusion of Crocus Metallorum, or of Mercurius Vita: The Emetick Tartar of Mynsicht, the expression of the leaves of Asarum: and in more tender Constitutions, Salt of Viriol, and Wine and Oxy-mel of Squills.

Purges must be given only in a small Dose, and such as are choice, lest they move a nauſeousness in the stomach of the sick.

Take of the Resine of Jalap, of Scammony, each five grains, of the Cream of Tartar one scruple, of Cinnamon powdered four grains; make a Powder, or let it be reduced into Pills, or into a Bolus, with the Conserves of the Flowers of Borrage, or Damask Roses.

Take of Scammony sulphurated half a scruple, of the Cream of Tartar fifteen grains, of Diaphoretick Antimony one scruple; make a Powder, and let it be given after the same manner.

If there be not a Feavour, a Dose of Stomach Pills cum Gummi may be given, or of Amber by it self, or with the Resine of Jalap.

Take of Pill. Rudii twenty five Grains, or half a dram, of Laudanum one grain; make four Pills, let them be taken at the hour of rest: These at first cause sleep, and Purge in the morning. Or, Take of Calomelanos one scruple, of the Resine of Jalap six grains, of Scammony four grains, of Ammoniacum what will suffice; make four Pills to be taken going to rest.

In a long and tedious Colick, when all other Remedies help little or nothing, I have often known this Medicine, being once or twice given, to have moved Salivation, with the greatest ease to the sick. For when the morbid matter, being heaped together, and thorowly impacted in the nervous Infoldings, and other places about the Abdomen, could not be moved by any other Medicines; the Mercurial Particles every way unfolding themselves, easily dissolve it, and divide it into small bits; and drive it up and down hither and thither, and at length wholly dissipate it. Wherefore in a long and pertinacious Colick, a gentle Salivation sometimes may be very happily administer'd.

Baths, and Sweating Medicines, are ordinarily wont to be prescribed in the pains of the Colick; but as to our observation, very rarely with success: For that these, by shaking the Blood and nervous humor, cause them to lay up still more matter into the Colick Mine, yea and that matter there deposited, to grow more hot and raging, and very rarely wholly shake it off.

Diureticks are wont much more profitably to be given, by which when the Blood is poured forth, and its ferocities plentifully precipitated, the nourishment of the Disease is cut off, and the bloody Mass being emptied, receives part of the Morbid matter, so that its reliques are more easily shaken off. For this end,

Take of the best Spirit of Tartar rectified half an ounce; let half a dram be given twice or thrice in a day, in a spoonful or two of the following Julep, drinking after it five spoonfuls of the same.

Take of the Water of the leaves of Burdock, or of Aron, or of Asmart, one pint; of the Water of the flowers of Elder and of Chamomil, each four ounces; of the compound water of Gentian, of the compound Water of Raddishes, each two ounces, of Sugar six drams; mix them together.

After

After the same manner as the *Spirit of Tartar*, may be given in a just Dose, sometimes the *Tincture of the Salt of Tartar*, sometimes the simple mixture, or the *Spirit of Sal Armoniack* succinated, or-impregnated with *Amber*.

Take of *Millepedes* prepared two drams, of the flowers of *Sal Armoniack* Tartarized one dram, of the Oyl of *Nutmegs* half a scruple, of *Turpentine* what will suffice; make a *Mass*, and let it be made into Pills; take three or four once or twice in a day, drinking after it a Dose of the *Julep*, or of the following distilled water five or six spoonfuls.

Take of fresh *Millepedes* or *Hog-Lice* cleansed one pint and a half, the outer rind of six *Oranges*, and of four *Lemons*, six *Nutmegs*; let them be cut small, and add to them one pound of the crumbs of stale white Bread: all being bruised together and well mixed, pour to them four pints of new Milk, and of Sack one quart; let them be distilled according to art, and the whole liquor mixed together; you may sweeten it with Sugar, or the Syrup of *Violets* as you please.

Mineral Pur-
ging Waters.

In a long and pertinacious Colick, to those who are of a more cold temperament and *Viscera*, Purging Spaw Waters, or Whey with the Syrup of *Violets*, are wont to be given oftentimes with great help; for both liquors, where they are agreeable, being plentifully drunk, refrigerate the stomach and the hot Intestines, and presently loosen and help them in their painful Cramps and wrinklins, or from the Convulsive winds or blasts that extend them; besides, they chiefly help (as I suppose) for that they tame and subdue the Saline Particles of another nature, insinuating themselves into the Morbific Mine, and other Saline and irritative Particles inhabiting it, and oftentimes carry them forth by Purging.

In this Disease, as all things are not convenient for all men, yea neither the same thing always for the same person, there is dayly need of the careful observation of a prudent Physician, that by the co-indications from things taken, that hurt or help, a right method of healing may be instituted, and varied as occasion serves.

2. The Vital
Indication sug-
gests Remedies.

2. The *Vital Indication* ought to be joyned to the *Curatory*, and that between whiles. For when the sick, being afflicted with torture, watching, Vomiting, and abstinence almost continual, often fall into languishment, and sometimes in danger of their lives; Remedies which sustain strength, refresh the Spirits, and procure some truces against the fierceness of the Disease, to wit, *Cardiacks* or *Cordials*, and *Hypnoticks* or such as cause rest, have here their turns.

Cardiack

Take of the Water of the flowers of *Chamomil*, and of *Elder*, each four ounces; of *Barlyed Cinnamon*, and of the whole *Citron*, each two ounces; of *Pearl* powdered one dram, of *Sugar* three drams; make a *Julep*, take of it five or six spoonfuls.

Take of the Powder of *Pearl*, and of *Crabs Eyes*, each one dram; let it be divided into four parts; let one part be given twice or thrice in a day, with the *Julep*, or with a Decoction of the roots of *Contrayerva*.

Take of the Conserve of *Clove-Gilliflowers* one ounce, of the Confection de *Hyacintho*, of *Alchermes*, each two drams; of *Pearl* powdered half a dram, of the Syrup of the juice of *Citrons* what will suffice; make a Confection, give of it the quantity of a *Nutmeg*, three or four times in a day with the *Julep*.

In less hot Constitutions, *Spirits of Harts-horn*, of *Sut*, of *Sal Armoniack* impregnated with *Amber*, also the *Tincture of Antimony*, or of *Coral*, do oftentimes give notable help.

Hypnoticks.

Opiates are of necessary use in the Disease of the Colick, without which, the sick cannot live, nor the Physicians, nor those who attend them be at quiet, or have any leasure time.

Take of the water of *Cowslip* flowers three ounces, of the Syrup of *Poppies* half an ounce, of *Aqua Mirabilis* two drams; mix them and make a draught to be given going to sleep.

If the pains be very strong, and yield to no such Remedy, prepared *Opium* and its compositions ought to be given. The *Laudanum* of *Paracelsus*, or the *London Laudanum*, Pills of *Syrax*, or of *Hounds-tongue* are convenient; a Solution of *Tartarized Opium* from sixteen to twenty grains is much used by me. Which Medicine indeed I have given with very good success, to some, that for a long time have been miserably vexed with this Disease, sometimes a great while every night or every other night.

3 The Preser-
vatory Indica-
tion, by which
are indicated,

3. The *Preservatory Indication* hath only place in the intervals of the fits, and endeavours the taking away the present foregoing cause of the Disease, and hindring it for the future, so that the fits of the pains may seldom or never afterwards return: For which end, the Blood and the nervous liquor ought to be purified, lest they should beget the morbid matter, and conserved in its due temper, and the Brain and the nervous In-
foldings

foldings of the *Abdomen* corroborated, lest they should too readily receive it. For these ends, a strict dyet being ordered, let them enter into a course of *Physick* Spring and Fall; such as we prescribed for the prevention of the *Gout*.

Vomiting in this case is never to be omitted, if it be agreeable, to wit, by which the *Emunctories* of the *Viscera* being emptied, the *Recrements* of the Blood, and the nervous Liquor, which otherwise would augment the morbid matter, may be received more plentifully; besides the nervous Infoldings, and all the parts are so shaken, that nothing of that which is about to go into the Mine of the Disease, is suffered to stagnate or to be heaped up there. Vomiting.

Let Purging for three or four times, with due intervals, and also in a hot Constitution, *Purgings*, *Phlebotomy* be celebrated; moreover, let altering Remedies, and especially *Chalybeats*, or such as are made out of Steel, when they do not Purge, be daily taken at medical hours.

But before all other Remedies whatsoever, the drinking of Mineral Waters, such as come from Iron, for a month, in the Summer time, is wont to give the greatest help: Altering Remedies. But when these are drunk, you must take heed, that they be rendred well and quickly by Urine or Stool, lest if they should chance to stay long in the body, by running into the Head or Feet, (as they often do) they should cause a *Vertigo* or the *Gout*.

Take of our Tincture of Steel one ounce, and let fifteen to twenty drops be taken twice in a day in seven Spoonfuls of the following Julep.

Take of the Waters of the leaves of Aron, and of Burdock, each half a pound; of the Magisterial of Earth Worms, of Gentian compound, of Pæony compound, each two ounces; of Sugar half an ounce; mix them.

After the same manner, here deservedly have place the Tincture of Antimony, and of Amber, yea and many other altering Remedies above prescribed for the Distempers of the Head, may also be used for the preservation from the Colick, whose foregoing cause proceeds from the Brain.

As to Charles Pisto's Observation, by which he endeavours to prove, that the cause of the pain of the Colick remains wholly in the Brain, because he had found a Serous deluge in the Head of a certain person dead of that Disease: I say, that this Serum being heaped up in the head, was the remote and antecedent cause of this Disease, and not the conjunct cause. But indeed it is probable, that from this first spring a certain portion of this superfluous and sharp Serum did descend, by the nervous passage, into the nervous Infoldings of the *Abdomen*, and there constitute the Mines of the Colick Distemper. Further, although the Morbid matter there slid down, because of the tenuity of the parts, and the smallness of the nests, can rarely be seen with the eyes, yet I have plainly seen and handled such a Mine of this Disease become inveterate and very cruel, not long since, in the *Mesentery*, opening the dead body of a certain Gentlewoman, of whom I have elsewhere made mention. The Objection of Charles Pisto solved.

Being sometimes since consulted with, concerning the curing of a Reverend old Man, grievously obnoxious for many years to the Disease of the Colick; I administer'd to him the same method of healing, and the Remedies I but now described; by the use of which, he found himself much better after a month or two, and within half a year he seem'd to be perfectly well, so that he lived afterwards wholly freed from any fits of the pains: But the Colick disposition had not long ceased, and he had omitted the usual course of Medicine, but he suffer'd about his throat a resolution or loosning in the Muscles serving for swallowing, which troubled him oftentimes, so that he was in danger to be choaked by Food, and chiefly by liquid things sticking in that place. Against this evil receiving help by Antiparalytick Remedies, he continued from thence six or seven years in moderate health; at last, being taken, the first time in the midst of a journey with an *Apoplexy*, he dyed. It is obvious enough in this case, that the *Recrements* of the nervous liquor, that were wont to be deposted about the nervous Infoldings of the *Abdomen*, did at first stir up the Distemper of the Colick; then the same being shut forth from that part, getting another nest for themselves about the Gangliiform nervous Infoldings of the Throat, brought in the resolution or short Palsie of the *Oesophagus*; and lastly, by reason of the same matter restagnating in too great a plenty in the middle part of the Brain, that deadly senselessness followed. The Reason of it.

A certain cunning and crafty little Lawyer, about fifty years of Age, was wont to be troubled for many years with a periodical Headach, and with a stupor or numbness of his Senses, and a great weight of his head; about the middle of Summer labouring very much with the aforesaid Distempers, he perceived a sudden ease from the applying of Topical Remedies; but a little after, he was taken with a very cruel Colick, then The second History.

being the first time; whose fit fell upon him with so much cruelty, that his strength suddenly failing, he fell into frequent swooning fits, with a cold sweat, which fit notwithstanding by leasure vanished within twenty four hours, without any breaking of wind, or going to Stool. But after that, he suffer'd frequent fits, and became obnoxious to the Disease; all which (as I was carefully informed) for the most part were usher'd in with a pain of the Head, with a *Vertigo*, and amazedness, or stupidity, and from hence he was wont to preface the pains of the *Colick* would very suddenly follow. In a certain fit, which lasted for twelve days with great cruelty, the sick person himself observed, and told me, that whilst the distemper troubled him in his Belly, he felt no trouble in his head, but the *Colick* pains remitting, presently the *Vertigo* returned, with the Headach: from which reciprocal translation of these *Symptoms*, from the Head into the Belly, and so on the contrary from the Belly to the Head, we may lawfully argue, that the same Morbific matter, flowing in the nervous Passages, falling down sometimes below, brought in the *Colick* Passion, and sometimes above; and restagnating, caused those distempers of the Head. Hither may be referred, what *Charles Piso* hath accurately observed concerning himself, being wont to be affected with *Cephalick* distempers, and the *Colick* pains by turns, and with a mutual dependency, *Seft. 4. C. 2. p. 335.*

The Reason of it.

The third History.

Not long since, a certain studious young Gentleman, and living a sedentary life, began to complain of a great stupidity of his senses, and a dulness, as also of a great weight of his Head, and almost continual sleepiness; further, his Ventricle or Stomach was become so slothful and stupid, that he wanted all manner of Appetite, whilst a Cure was instituted against this evil disposition, by Remedies which roused up the Spirits, and shook off their burthens, this Gentleman fell into a most cruel *Colick* Passion (which he was never obnoxious to before) from which a most cruel pain, like the boring of an Auger, possessed the middle of the *Abdomen*, his Navil being drawn inwards, and notwithstanding the daily use of all kind of Remedies, it continued for three weeks, with great cruelty; that in the time he could take no rest, but what he received from *Narcotics*, nor could he receive any ease from his pains, unless by an hot fomentation. Certainly in this case it is plain enough to every one, that the impurities of the nervous liquor being gathered to a certain fullness, was the immediate or conjunct cause of the whole sickness; which matter subsisting first in the Head, brought in the notable stupidity of the Brain and the oppression of the Animal Function; then being fallen down, by the passage of the Nerves, into the nervous Infoldings of the *Abdomen*, caused that cruel and daily *Colick*.

The Reason of it shew'd.

FINIS.

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